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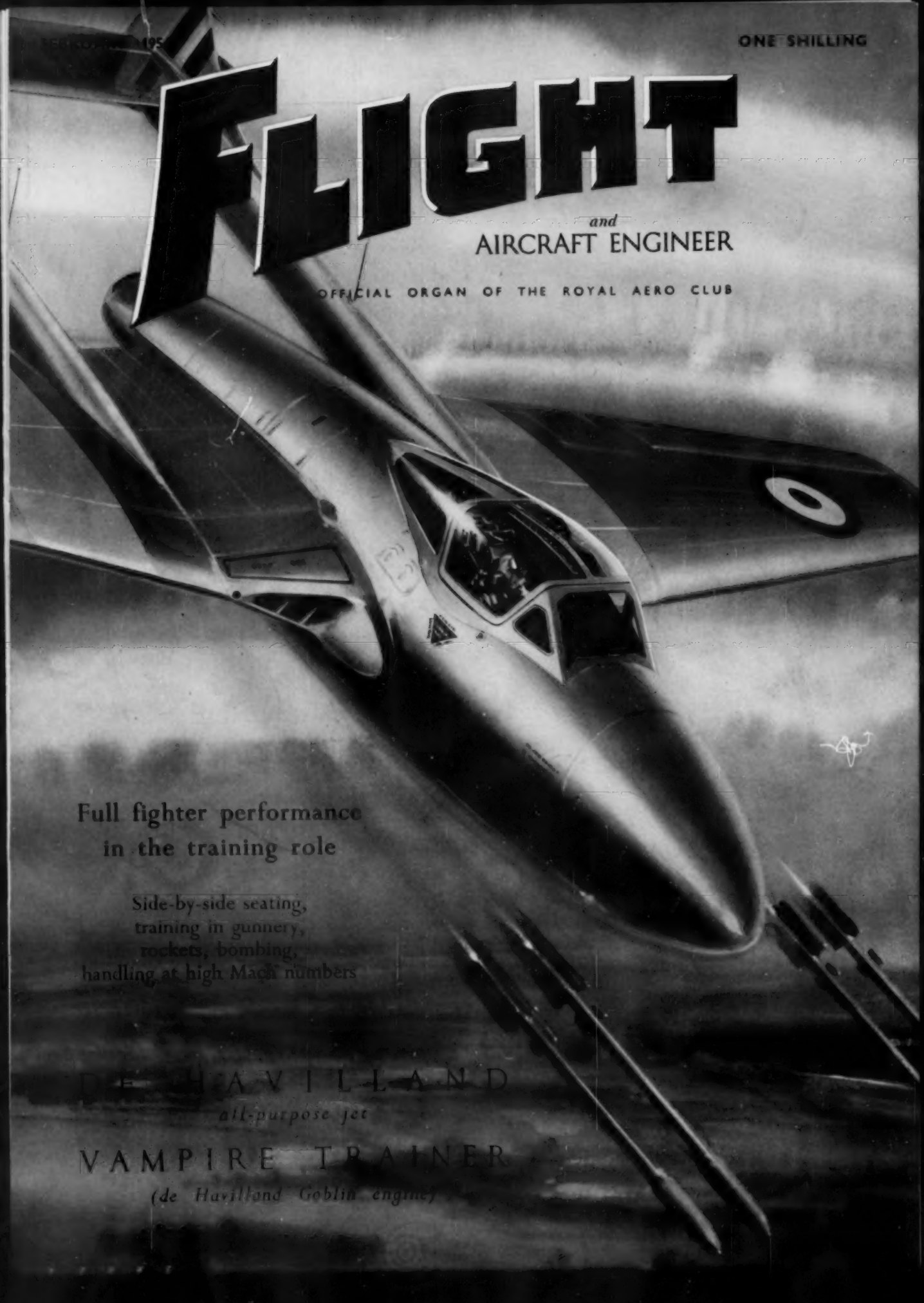

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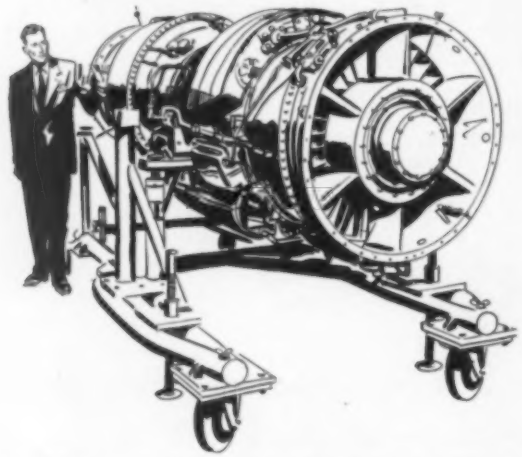
United Airgram

UNITED AIRCRAFT EXPORT CORPORATION

J-57 OFFICIALLY RATED IN 10,000-POUND THRUST CLASS

The J-57, Pratt & Whitney Aircraft's big, new turbojet engine, has been officially rated in the 10,000-pound thrust class, making it the first turbojet in aviation history to achieve a five-figure power rating, and the most powerful jet now in production. The new engine has been under close military security wraps since its inception. Not until last November were external photographs made public.

William P. Gwinn, general manager of Pratt & Whitney Aircraft, said "We believe the J-57 is at least two years in advance of any other engine we know of in the turbojet field. This includes British as well as American jet engines."



The U.S. Air Force, for whom the big jet was first manufactured, disclosed that the J-57 has the lowest specific fuel consumption of any turbojet engine presently in production for its aircraft, as well as a rapid rate of acceleration.

The P&WA design for the axial-flow engine, incorporates an arrangement of dual compressors in line, which gives the engine a high compression ratio and unusual fuel economy.

J-57 production began at East Hartford in February, 1953. The engine powers the Air Force's new heavy jet bomber, the Boeing B-52 Stratofortress, and the new supersonic fighters, the North American F-100 Super Sabre, holder of the world's speed record, and the Convair F-102. McDonnell's F-101 Voodoo is also scheduled to have the J-57, as are the Navy's Douglas A3D attack bomber, and Douglas F4D fighter.

NEW HAMILTON STANDARD FACILITIES SPEED PRODUCT DEVELOPMENT

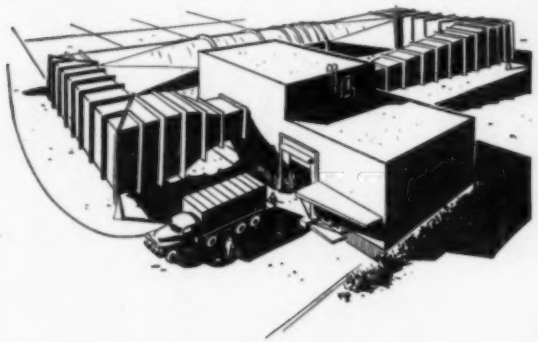
Extensive new development laboratories have been completed at the Hamilton Standard plant in Windsor Locks, Connecticut, to give this United Aircraft Corporation division one of the most complete facilities of its kind in the world.

The laboratories contain new propeller test cells, each capable of taking test propellers up to 28 feet in diameter and engines up to 20,000 horsepower. A giant "clamshell" type altitude chamber has also been installed, in which 20-foot propellers can be tested at simulated altitudes of 100,000 feet. Both the test cells and the altitude chamber indicate the extent of Hamilton Standard's development work with huge new propellers for future cargo and transport aircraft.

The big laboratories also contain development and test facilities for the division's extensive work in the aircraft equipment field. Included are (1) fuel control laboratory, containing a sound-proofed test cell which is able to take jet engines of up to 25,000 pounds of thrust in testing fuel controls and other accessories; (2) pneumatics laboratory, with huge machines to compress, heat, or evacuate air, all designed for further development of air cycle cooling units, pneumatic starters, valves, control systems and similar products; (3) combustion laboratory, with explosion-proof test chambers and remote control equipment designed for advanced work on self-contained engine starters and auxiliary power supplies for guided missiles; (4) hydraulics laboratory, with complete facilities for hydraulic and mechanical testing of propeller components, variable displacement pumps and similar equipment.

WIND TUNNEL UNDER CONSTRUCTION AT CHANCE VOUGHT AIRCRAFT

Construction of a low-speed wind tunnel, costing approximately $1 million, has been started at the Chance Vought Aircraft factory in Dallas, Texas, for use in the division's jet aircraft and guided missile programs. The division has been using various facilities in other parts of the United States for its test work in the low speed ranges. Now, however, the requirements for such work have grown to the point where an immediately available tunnel is essential to meet schedules.



Airspeeds in the wind tunnel test section will range up to 200 m.p.h., which is adequate for design studies concerned with the aerodynamic problems of such speed ranges as take-off, low-speed cruising, and landing. A 20-foot fan, powered by a 1500 h.p. motor, supplies air for the 7 by 10-foot test section. Models under test will be remotely controlled through a wide variety of loads and flight attitudes, and resulting data will be recorded automatically.

SIKORSKY PLANS NEW FACTORY FOR S-56

A new branch factory, containing approximately 500,000 square feet of floor space, will be built by Sikorsky Aircraft in Stratford, Connecticut, only a few miles from the present plant at Bridgeport. Twin-engine S-56 type helicopters for the U.S. Marine Corps will be made in the new plant on its 200-acre site. Sikorsky's plans, at present, call for about 3000 employees for the Stratford factory, in addition to the 4500 people now working at the main plant in Bridgeport.

The S-56 type, in its military version will be able to carry 26 soldiers with full battle equipment. Sikorsky expects to produce, in the not too distant future, a civilian version comparable in capacity to a twin-engine airline.

Meanwhile, National Airlines has put a Sikorsky S-55 helicopter into operation, thus becoming the first major scheduled passenger airline in the U.S.A. (and second to Sabena, in the world) to utilize a large transport helicopter. National plans to carry passengers with helicopters to its main trunkline terminal at Miami, Florida.

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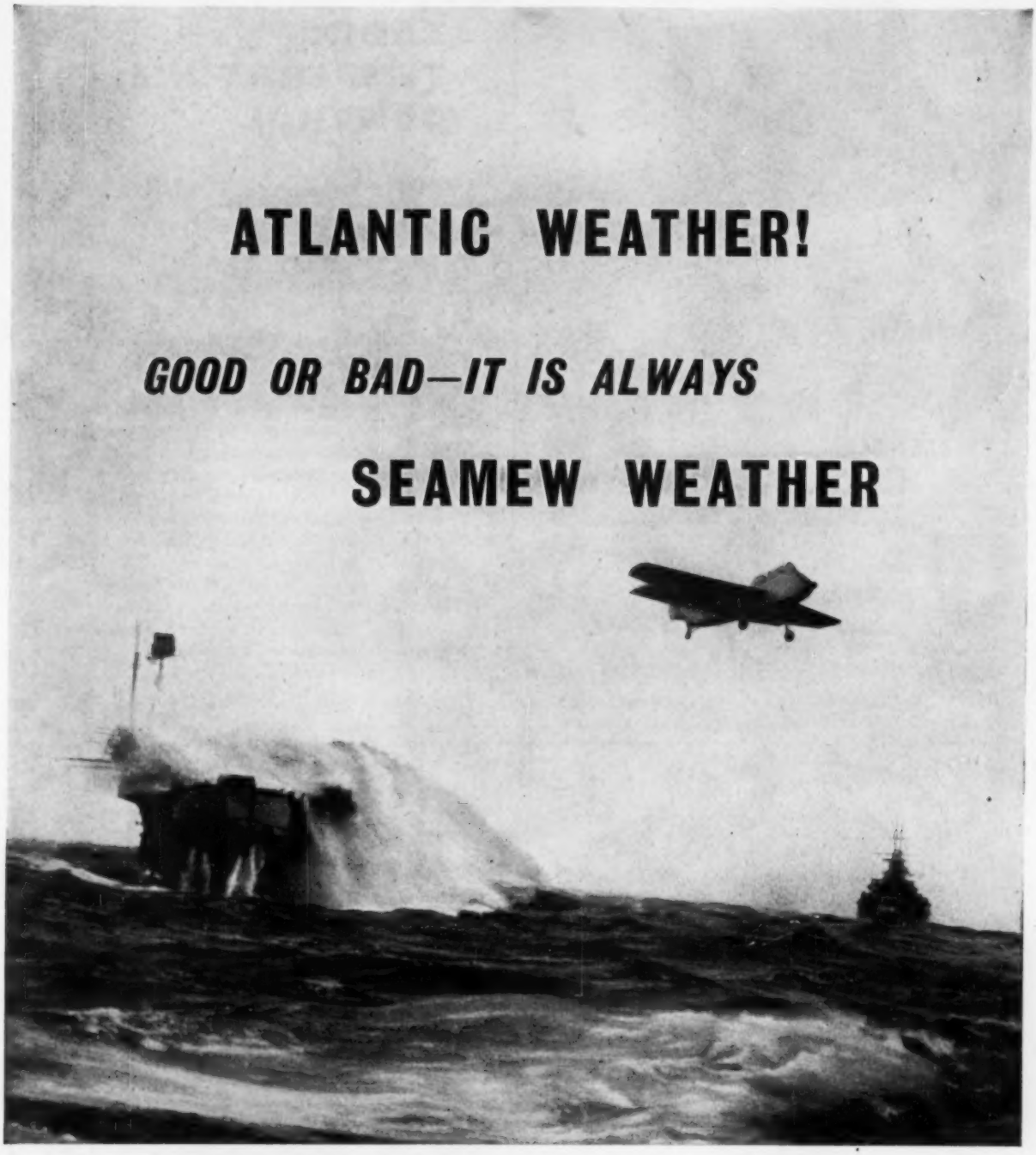

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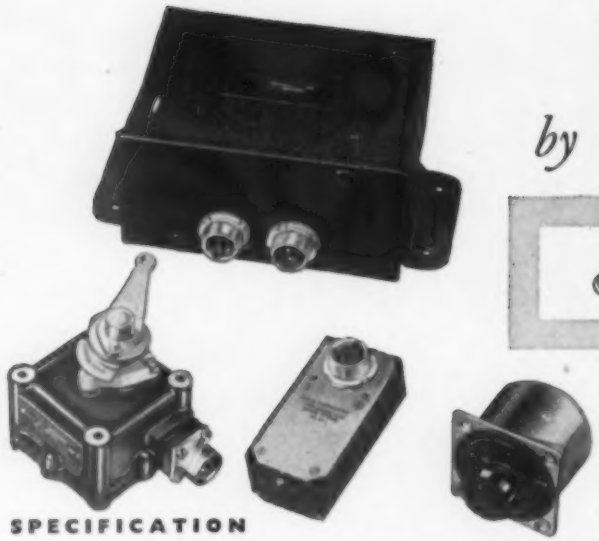

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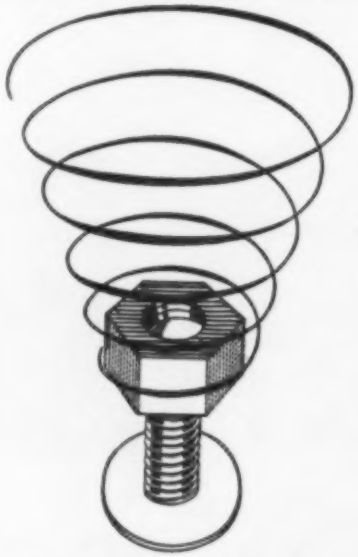

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Per Ardua

THE loss of the Elba Comet—still unexplained—and the forced landing by the Britannia, reasons for which are already known, are about as discouraging as anything could be. Yet similar accidents have marked the path of aviation progress from the beginning and, moreover, aviation is by no means unique in this respect. World-wide concern about these events, and the attention focused upon them, is a measure of the fame of these British turbine airliners. Publicity is part of the price of fame; the unexplained loss of an airliner of rather older type at Rome on the day following the Comet disaster, just as spectacular and serious in itself, made news for no more than one day.

Everyone hates mysteries of a malevolent kind, whether they surround Comets or DC-6s. It is not surprising that some thinking people suspect sabotage in both cases—sabotage resulting perhaps from an explosive among the freight or luggage, remotely linked up in its detonating mechanism with radio frequency change. It is to be hoped that the salvage operations off Elba will meet with early success and that any parts brought up will yield positive information. The DC-6 was almost entirely destroyed. The best send-off the Comet could have on resumption of services would be confirmation of its clean bill.

The operators of the Comet (who neither suspect nor rule out sabotage) in conjunction with the makers and the A.R.B., have completed a most detailed inspection of all their aircraft. In the absence of any positive evidence as to cause, they have had to sit down and consider the remotest possibilities such as the final effect of sequences of trivial failures. Medical evidence—in spite of reports of various conclusions—has been more confusing than helpful.

Fifty modifications (in round figures) are now to be incorporated in the Comet 1s, some of which may be described as extra-precautionary; the details are given on page 193. But this does not mean that faults have been found. Several of the modifications are in the nature of routine improvements, with low priority, which were in any case being incorporated when convenient during overhauls and inspections. They are all to be found in later-series Comets. This is the accepted routine with commercial aircraft, and only the most important of modifications—found to be necessary after the granting of a C. of A.—cause a machine to be taken out of service for their incorporation. In the exceptional circumstances, the seven B.O.A.C. Comet 1s are to be kept out of service until the end of the month, and by this time the modifications will have been incorporated. Operations on the South African routes will then be resumed after consultation with the Minister of Transport and Civil Aviation.

It is interesting to note in passing that some of these adjustments may improve the Comet's chance of a reasonably smooth passage through the American C. of A. tests when the time comes. For example, the armour plate now to be fitted to protect the fuel tanks from itinerant turbine-blades meets a point of criticism which has been levelled from the American side. They actually armour-protect certain of their own civil aircraft from the possible effects of much smaller, though faster-turning, exhaust turbine blades in compounded piston engines. The thought occurs that, during all the thousands of hours of running which Ghost turbojets have completed, we have heard of no single case of a turbine failure. Nevertheless, pod exponents will no doubt regard this modification as significant.

Some of the improvements are concerned with fire-warning equipment, ventilation, reduction of temperature where heat is undesirable, and with the removal of the already remote possibility of electrical faults occurring in the vicinity of hydraulic equipment. No mention has been made of the possibility of filling the air space in the main fuel tanks with an inert gas as the kerosine is consumed. This was the practice with some war-time aircraft.

So far as the Britannia is concerned, through skilful and courageous action the loss was fortunately confined to the prototype itself—and to the delay in completing the C. of A. trials upon which the ill-fated machine was engaged. The first production Britannia which is nearing completion at Filton will now have to do this work. Certainly a maximum effort is called for to speed-up progress on this third machine. B.O.A.C.'s target date for introducing the Britannia into service was May 1955. Four would have been ready by then. This should, with luck and hard work, be delayed by no more than three months.

SECOND SEA HAWK SQUADRON is No. 898, now "working up" at Royal Naval Air Station Brawdy (H.M.S. "Goldcrest"), Pembrokeshire. In command is Lt. Cdr. D. G. Parker, D.S.O., D.S.C., A.F.C., R.N., and this recent "Flight" photograph is evidence that under his experienced direction a high standard of flying has already been achieved.

FROM ALL QUARTERS

More Comets for Air France

A FURTHER three Series 2 Comets have been ordered by Air France, bringing the airline's total number of Comet 2s on order to six. The contract for this second batch was signed on December 31st last, and delivery of the first Series 2 machines to the company is expected to begin early in 1955.

Since the introduction of the three Comet 1As on Air France routes in August 1953 these machines have flown nearly half a million miles on services between Paris and Algiers, Casablanca, Beirut and Cairo.

New Engines

REFERENCE may now be made to the Napier Oryx gas-turbine power-plant, which is likely to have basic applications in both fixed- and rotary-wing fields. The Oryxes NOr. 1 and 2 are contained in a recent list of new engines, the others being: Mamba ASM.6; Double Mamba ASMD.4; Sapphires ASSa.4, 5 and 7; Olympus BO1.1/2C; Gyron DGy.1; Avons RA.23 and 28; and Conways RCo.2 and 3.

The YC-124B Flies

ALTHOUGH it is conventional enough in appearance, the Douglas YC-124B Globemaster is a machine of outstanding importance to America, and it marks a significant turning-point in American engine development.

Until now American turboprops have not been particularly inspired in conception or successful in practice; partly, no doubt, this reflects official policy in sponsoring turbojet development at the expense of all other forms of power unit. Only the U.S. Navy backed the turboprop and they allocated many millions of dollars to development of the Allison T38 and T40 and P. and W. T34.

Today, the Allison engines are still not "out of the wood," but are being further developed as the more powerful T56 coupled unit for the Lockheed C-130 transport. The Pratt and Whitney is more promising: a long, steel, single-shaft engine of 5,500 h.p., it has been selected as the power unit of revised versions of the C-124 Globemaster, C-97 Stratofreighter and C-121 Constellation.

The YC-124B Globemaster remains a four-engined, low-wing machine with two decks and over 10,000 cu ft of interior stowage space. In Korea C-124s have done sterling work, lifting 100-180 troops, casualties and heavy freight. The turboprop conversion is, unlike the original C-124, pressurized (to give 8,000ft interior at 30,000ft). The whole aircraft has a very complete pneumatic system, which provides power for starting, pressurization and auxiliaries. Airframe modifications are numerous; in particular, the vertical tail is taller and of greater area, and the horizontal tail has a new cross-section profile, to give better stability and control. The whole structure has been revised and strengthened.

Curtiss airscrews are retained, but the diameter has gone from 16ft to 18ft, and blade area is roughly doubled. With about 60 per cent more power than before, the turboprop C-124 can lift 64,000 lb design payload for an a.u.w. of 200,000 lb. But the U.S.A.F. turboprop conversions are, for the moment, experimental. The YC-124B flew from the company's Long Beach plant to Edwards A.F.B. on Feb. 2nd. At the controls was Frank Boyer.

LOOMING LARGE in America's transport and turboprop development programmes is the Douglas YC-124B Globemaster, illustrated in this first picture and discussed in an accompanying paragraph.

Plain Speaking by Capt. Pritchard

A CRITICISM of "State-mindedness" in the aircraft industry was made by Capt. J. Laurence Pritchard, a member of the Council of the Royal Aeronautical Society and secretary of the Society for over 25 years, when he addressed the R.A.E. Technical Society at Farnborough, last week. "The world is becoming more and more State-minded and less concerned with the vital importance of the individual," he said. "The aircraft industry suffers from that most serious thing in any business, a monopoly of the customer.

"The aeroplane has not developed in the way that many only 20 years ago expected. All the work of civil aircraft has been done under military research. We would have a much better civil aeroplane now if there had been no military aeroplane. We could have got the same results with less horsepower through streamlining. . . . The moment you get a simple thing in this world every engineer and research worker gets down and says 'How can we complicate this?' "

Criticizing research secrecy imposed on the grounds of security, Capt. Pritchard averred that we were facing one of the most disastrous crises in the technical and scientific worlds for several centuries. "Deliberate suppression of information results in a gross distortion of facts and the drawing of erroneous conclusions," he said. "If engineers and scientists accept restriction of dissemination of information they will cease to be free agents and lower the high standards of their profession. In fact, I think, they have already lowered them."

He continued: "The Royal Aeronautical Society is doing nothing to fight against this suppression of information. No longer can members speak freely in discussion. Many do not do so for fear of saying too much. The jibe has been made that since the First World War the R.Ae.S. has been nothing more than a mutual admiration society. As a member of the Council and one who has served the Society for 34 years I would not disagree."

Aeroelasticity and Electronic Computors

THE profound impact of the use of the electronic digital computing machine on the structural approach to aeroelastic problems was the main theme of a lecture due to be given before the Royal Aeronautical Society last night by Dr. D. Williams, D.Sc., F.R.Ae.S., of the Royal Aircraft Establishment. The title of the lecture was *Recent Developments in the Structural Approach to Aeroelastic Problems.*

In addition to the main theme mentioned above, Dr. Williams

SPRINGBOK MARKINGS on the fuselage sides are not the only point of interest in this new picture of North American Sabres of the South African Air Force. Having replaced ageing Mustangs in Korea, these are the only Commonwealth Sabres to have seen combat.

stated in his paper that the impact of the digital computor on structural analysis, or "stressing," was going to be no less profound. If the response of a structure to applied loads could be determined accurately enough to form the basis for computing a whole series of frequencies and modes, that same response, giving deflections in terms of loads, constituted a valuable help towards (if not everything that was required for) stressing the structure. As this was true for every kind of structure used in mechanical and civil engineering, the change which the machine could bring about in man-hours of computation was revolutionary.

The first part of Dr. Williams's paper went on to show the kind of operations carried out by the machine, and the potentialities of the matrix approach. In the second part, the principles established in the first part were applied to the structure of a delta.

More Provost Orders

FOUR air forces have now ordered Percival Provost basic trainers. The R.A.F. already has them in service in considerable numbers; the Southern Rhodesian Air Force recently placed an order; and the makers now announce that the Burmese and Eirean Air Forces have followed these examples.

A.M. L. F. Pendred, C.B., M.B.E., D.F.C., C-in-C. Flying Training Command, in a speech at the handing-over of the hundredth Provost last week, said that the aircraft was "exactly what the R.A.F. wanted." The other air forces should find that the Provost (Alvis Leonides) offers, with economy of operation, a wide range of utilization from basic to advanced flying training.

Guided Weapons Posts

Mr. W. H. Stephens.

TWO new appointments in the guided-weapons field were announced last week by the Ministry of Supply. Mr. P. E. Pollard is to go to Washington as Director (Guided Weapons and Electronics), British Joint Services Mission, and Mr. W. H. Stephens is to be head of the Guided Weapons Department at the Royal Aircraft Establishment, Farnborough. Originally a member of Sir Robert Watson-Watt's pioneering radar team, Mr. Pollard was Chief Superintendent, Radar Research and Development Establishment, from 1947 until late last year, when he was appointed to special duties under the Controller of Guided Weapons and Electronics. Mr. Stephens has held the post of Superintendent of the Assessment Group at the Guided Weapons Department, Farnborough, since 1947.

The Britannia Mishap

WHILE making a routine C. of A. flight on Thursday, February 4th, the second prototype Bristol Britannia developed a fire in an engine nacelle and was forced to make an emergency landing on the shore at Littleton-upon-Severn. The pilot was Mr. A. J. Pegg, and there was on board a total of fourteen crew, observers and official passengers. Only one, Mr. J. Parry, the radio officer, received slight injuries. Among those in the aircraft were Dr. A. E. Russell, the chief designer, Mr. W. R. Farnes, sales manager of the aircraft division, and two representatives of K.L.M., Mr. E. A. Driessen, head of the research bureau in the operations division (who was occupying the second pilot's seat) and Mr. G. J. Malouin, operational technical adviser in the California area.

The Britannia, G-ALRX, had been airborne for about an hour when fire in the starboard inner nacelle was detected in the cockpit and noted by one of the passengers. The fire-extinguishing equipment for the Proteus turboprop was operated but was apparently ineffective against what seems to have been an oil-fed fire in the nacelle behind the engine. The Proteus turboprops are mounted high and their jet-pipes pass over the wing. The aircraft was at the time flying at 9,000ft above cloud at an approximate position over Ledbury, near Worcester, 50 miles north of Filton.

In the first message regarding the fire, received at Filton, the pilot indicated his intention of trying to reach base, but shortly afterwards another warning was transmitted of the need to attempt a crash-landing near Sharpness. Between eighteen and nineteen minutes elapsed from the time of detection of fire to Pegg's skilfully executed belly landing on the frozen mud of the Severn river-bank. Contrary to early newspaper reports, no tanks blew up and no engines, burning or otherwise, were knocked out by the landing, but the port outer airscrew and reduction gear (high side of the bank) did come off. The other units, including their airscrews, appeared relatively undamaged. It will be interesting to learn whether from experience a free-turbine arrangement can be expected to reduce damage to power plants in the event of a wheels-up landing.

Since its first take-off on December 23rd this prototype had flown for 51 hr 10 min during 24 flights. Its loss will mean some delay in obtaining a C. of A. for the Britannias, because the completion of C. of A. tests must now await the emergence of the first production aircraft. This was originally to be ready in July, but the makers state it may be possible to pick up as much as two months in time. Production plans for the rest of the B.O.A.C. fleet should not need to be altered, but the date of first services will have to be put back by three to four months.

After the landing of -RX attempts were made to drag her above the high-tide mark. These failed and, after being submerged up to its tail fin by the next tide, the aircraft was lightened by jettisoning the remaining fuel; on Friday, with the aid of flotation bags, and winches on Army tanks sent to aid in the recovery efforts, it was hauled well up the river bank. In the meantime the port wing had been severed and transported back to Filton for examination. More serious damage seems to have come from the salvage attempts than from the landing.

Most of the aircraft will be recovered, but there is no thought of it flying wholly or in part again. It will have some value, however, for test purposes. The machine was the property of the Ministry of Supply and was not insured. Its value has been estimated as about £800,000.

With wing, engine and nacelle to inspect and the recordings from the automatic observers in the fuselage intact, it will most probably be possible to discover the exact cause of the fire and the reason for its persistence. This unfortunate mishap will in no way prejudice the Britannia's future in commercial service and, in fact, to some extent its extraordinary durability in withstanding eighteen minutes of fire without structural failure in the wing enhances its reputation.

MUD-BESPATTERED, but surprisingly intact—the second-prototype Britannia after the belly-landing on the mudflats of the Severn. Marks seem to indicate that only the starboard outer airscrew was turning.

THE GAS TURBINE

—and Civil Aviation: Sir Miles Thomas's Brancker Memorial Lecture

ON February 8th the Institute of Transport's Twelfth Brancker Memorial Lecture was delivered by Sir Miles Thomas, D.F.C., M.I.Mech.E., M.S.A.E., chairman of British Overseas Airways Corporation. His paper, which is summarized below, was entitled *The Impact of the Gas Turbine on Civil Aviation.*

After introducing his lecture with a tribute to Sir Sefton Brancker "and to all the many good things that he did for aviation," Sir Miles Thomas outlined the earlier stages of Britain's policy of developing turbine-powered civil aircraft. The first part of the paper was concerned mainly with amplifying the lecturer's belief that "the revolution caused by the introduction of the gas turbine into civil air transport is comparable to the replacement in shipping of sail by steam"; it represented "the biggest single step forward in the development of air transport since the first commercial flight was made at the end of World War One."

Engine Economics.—Discussing the lessons of experience gained with the turbine engine itself, Sir Miles said that its initial higher cost meant that a greater output per unit cost must be achieved. We could not afford to have spare engines lying along the routes waiting for a service breakdown; they would have to be positioned and re-positioned as speedily as possible by air. There was an even greater need for the pooling of equipment between operators and for a greater effort to be made to salvage and re-work the expensive materials used in the hot parts of the engine during the overhaul processes. With power plants costing up to £45,000 each it might well be that—just as some road operators bought tyres on a mileage basis—the airline operators might buy engines in terms of flying hours, the manufacturer backing his product throughout its life ("real private enterprise").

In terms of reduction in specific consumption we could look forward confidently to at least halving the Comet 1 figure during the next ten years. On the maintenance side the gas turbine would need to be designed expressly for airline use if full advantage was to be gained of the opportunity to reduce man-hours per engine-hour of operation: the hot parts of the engine might be assembled in such a fashion that they could be readily detached and replaced without disturbing the rest of the engine.

Productivity.—Use of the jet airliner, with its high potential of ton-miles was analogous to the introduction of automatic machine tools in the production line of a factory. Doubling the speed of flight meant doubling the whole *tempo* of operation of the airline system. Already B.O.A.C. had had to spend many thousands of pounds in improving their telegraphic ground communications to give a better booking service for passengers.

The Price of Pioneering.—Britain was the first and only country outside America to pin its faith in its own products and to cease spending currency on what can be described as dollar aircraft. When we bore in mind that these dollar aircraft were not only established as reliable, well engineered instruments of transport, but that the whole web of rates and structures for international air fares was predicated on their performance, we saw how difficult was the task of British manufacturers to break through the sales barrier. It was only by being bold and conceiving something entirely different, such as the jet—and with the corporations, as operators, proving them on the routes—that large-scale business successes could be assured. The Comet, Viscount and Britannia had attracted a fair volume of initial orders, but that volume was so far nothing like big enough to amortize the very large tool charges involved. The situation was complicated by the fact that rate of development was still mercilessly outstripping the speed of production—a graphic case being the Brabazon, which was "gloriously out of date" by the time it flew.

SIR MILES THOMAS, chairman of B.O.A.C. and author of the Twelfth Brancker Memorial Lecture summarized above, signed an order for five Comet 3s on February 1st. Also present as the contract was sealed were Mr. F. E. N. St. Barbe, sales director of the de Havilland Aircraft Co., who is seated on the right of Sir Miles, and—standing between them—Mr. Basil Smallpeice, B.O.A.C.'s financial comptroller.

How Golden is Silence?—Under this heading the lecturer expressed some interesting views on the policy of publishing plans for new projected commercial aircraft long before they reached the production stage. He said: "I suppose that is because I was brought up in the motor trade, where it was almost a capital offence to talk publicly about a new model before the last of the old series had been sold. True, the units involved were smaller and we were selling to the public rather than to operating companies. But I must say that it shocks me in the commercial sense to find that before the first Mark I 'XYZ' jet liner has been delivered I am being urged to commit myself for a batch of the Mark IV or Mark V series of the 'XYZ.'

"It must also be very confusing to foreign operators. Their technical departments have probably convinced their Boards that the Mark I 'XYZ,' which will be available in two years' time, is just what they want, when the Board reads in its technical Press, or, more probably, with more human appeal in its daily Press" [we note that Sir Miles was referring to operators abroad; presumably his own airline's purchasing policy is not heavily influenced by the daily Press], "that the Mark IV or Mark V, now announced, is going to make the Mark I model look like last year's Easter bonnet. The result is delay all round, culminating, in all probability, in a last-minute decision by the foreign operator to buy an addition to his existing fleet of aircraft, which at any rate does not complicate his spares problem."

Export Potential.—The gradual infiltration of British gas-turbine aircraft into overseas markets would be steady and progressive. The heat and burden of the development period after the aircraft had left the manufacturer's testing department would be borne by its first purchasers—a costly process. Sir Miles urged that "as the commercial projection of the British aircraft industry, the two Corporations, B.O.A.C. and B.E.A., deserve concrete recognition and financial recompense for the pioneering work they have done and will be doing."

Turbojet or Turboprop?—Speaking of B.O.A.C.'s earlier decisions to develop both pure jet and turboprop, and not to order any piston-engined versions of the Britannia, the lecturer said: "I am perfectly certain we were right."

He then quoted some comparative figures for Comet 2 and Britannia with first-class accommodation for 44 and 63 passengers respectively. The maximum distances which they would operate with full payload, but making no allowance for wind, were, respectively, 2,440 and 3,020 statute miles. The Comet 2's block speed would be 412 m.p.h. and its specific fuel consumption would be 39.5 lb per 100 seat-miles; the Britannia would have a block speed of 323 m.p.h. and a specific fuel consumption of 24 lb per 100 seat-miles. Over the shorter sectors tourist-class Britannias could show a specific consumption of 16.4 lb per 100 seat-miles.

The lecturer neatly summed up the respective merits of the turbojet and turboprop by saying that one was very fast and reasonably economic while the other was reasonably fast and very economic. By reason of its airscrew mechanism, the turboprop engine was more complicated, and so the overhaul costs might to some degree offset its fuel economies. But it provided reverse thrust for braking, without further mechanical devices, which again had to be taken into the final cost equation.

Propulsive Efficiency.—An attractive feature of all types of gas turbines was that at present they were only at the beginning of their development, in contrast to the current piston types. It seemed to the lecturer that any attempt to extract any extra power from the already tortured gas system in piston engines must place heavier duties on the exhaust valve guide, already a much over-

THE GAS TURBINE . . .

worked component. In the test shops of the jet-engine manufacturers' substantial and fundamental advances were being made. Approved ratios of up to 15 to 1 atmospheres of the in-going air, before it was mixed with fuel, were being confidently discussed and incorporated in new designs.

The economy of any heat engine, whether piston or turbine, was dependent on the degree of mixture compression achieved before combustion, since this determined the useful weight of oxygen used. In this respect the modern jet engine was where the present piston engine was possibly 30 years ago, and a parallel advance in economy of conversion and the efficient utilization of the heat latent in the fuel would undoubtedly be achieved.

Licensing Problems.—The increased economic range of civil airliners meant that world routes could be flown in either direction and would therefore further complicate bilateralism and traffic rights as geographically defined in the past. Such an aircraft as the long-range Britannia, which B.O.A.C. confidently expected to be operating in 1958 (carrying more than 80 people at over 400 m.p.h., with a still air range of more than 5,000 miles) would have a profound effect on international routes. Inter-governmental discussions should start early and in an atmosphere of good faith if the potential of international civil jet-propelled aviation as a beneficial factor in world affairs was to be achieved.

Fuel for the Future.—Although the R.A.F. had now decided not to use a wide-cut gasoline instead of kerosine, the arguments for making this change did not attract the airline operator to the same extent, if at all. Sir Miles listed some of the reasons why they had to consider the possibility of using a fuel commercially and operationally more attractive than kerosine. Only a small proportion of kerosine was distilled from crude oil; the output of present-day refineries was based on the predominant need for high-grade petrols. With jet aircraft, fuel represented more than one quarter of the operating cost; it was thus obvious that small fractions of saving in this direction could greatly influence an airline's annual result.

Along with the fuel suppliers and with other international airline operators, B.O.A.C. were actively considering the possibility of one of the diesel oils which, because of their greater heat content, offered higher potential performance and longer range. Other advantages would be lower risk of fire, due to higher flashpoint and lower volatility of the heavier fuel; on the other hand, pumping difficulties in lower temperatures would have to be weighed against these gains.

Airport Considerations.—An airport was a factory producing travel facilities; it had to be properly mechanized. The need to plan now for faster static-line refuelling was illustrated by the fact that already the Comet 1 tankage capacity approached 50,000 lb weight of kerosine, and forthcoming transatlantic jet airliners would probably require double this quantity. Sir Miles said: "Instead of mobile tankers, coaches, starter-trucks and honey-pots running around and cluttering up the apron area, we must contrive to 'dock' the airliner so that static service pipelines, weatherproof gangways and the like can be coupled up without fuss or delay."

Jet Noise.—The lecturer felt that "we should design away from this problem as much as possible." The noise characteristics of a turbojet aircraft were highly directional, and this lent obvious scope to planning the layout of the airport and the operation itself so that these effects were minimized. It was the introduction of a new noise which attracted attention: experience showed that when first introduced some piston-engined types attracted as much notice as the latest jets. A point in favour of the gas turbine was that it required less ground running. B.O.A.C. were striving to reduce this still further by providing the maximum degree of external energy-sources for functional testing of all kinds without the noisy and costly business of running the main engines.

Airport Development.—The important factor to realize in transporting passengers from place to place was that it was the elapsed time of departure through to destination which really mattered, and not just the speed at which they travelled in the air. This did not only concern the speed of passenger travel between the air terminal and the airport itself: "I emphasize again, there is the manifold problem of slick passenger handling as between the traffic counter of the airport and the actual seat in the aircraft. It must be done in psychologically attractive, comfortable and economical conditions. There must be no dramatic sense of human urgency; and yet time must be reduced to the minimum."

In developing airports to handle jet traffic, said Sir Miles, "We want the kind of imagination that has motivated the controllers of London Airport to build mine detectors into the perimeter tracks so that from the control tower the progress of a taxying aircraft can be accurately monitored even when it is completely invisible. There is plenty of scope for other similarly bright ideas."

The Jet Liner of Tomorrow.—It would be unrealistic for B.O.A.C. or any other operator to try to enter the design field and predicate precisely what kind of aeroplane they wanted by, say, 1965. Pressure for sudden further development in performance might be created by American competition. We should not overlook the fact that the Americans were grand producers; once they made up their minds to freeze a design for production they had a happy knack of overcoming all obstacles and turning out a fine workmanlike job in vast quantities.

Speed of Progress.—Nonetheless, said the lecturer, any such undertaking in the jet field required measurable time. It took every minute of six whole years to get from the final conception of the Comet on paper to the carrying of the first fare-paying passengers. He added: "There are certain fundamentals that control the speed of prototype development and pre-production tooling on both sides of the Atlantic. It takes just as long for a casting to cool in America as it does in England. A Keller die-sinking machine operates at the same speed on both sides of the Atlantic. The finest tungsten-tipped tool only cuts metal on a lathe or milling machine at the same feed and speed in Connecticut or Derby. It takes sixty minutes to do an hour's test flying at Muroc or Boscombe Down. It is only when the Americans are actually in production that their volume of output and the scope of their operations give them an advantage."

Production, not Prototypes.—There would be good notice of the necessity for introducing new types to follow the existing known range of Comets and Britannias and Viscounts. We should then have to decide whether their successors would be deltas with buried by-pass engines in the wings, or swept-wing designs with conventional tails; whether the power-unit would be a straight jet or a turboprop; whether the aircraft would be a landplane or a flying boat. Sir Miles continued: "There is no 'best' aeroplane; no one type that will do everything. The measure of successful administration is the ability to decide on the optimum compromise between specialization and standardization of equipment.

"Today, moreover, our call is for production, not merely prototypes . . . The war has been over eight years; airlines fly across the Atlantic nearly 100 services a week. There is still no commercial British aircraft that will fly the Atlantic competitively and profitably. That is a sobering thought. Before we search for the secrets of supersonic civil aircraft, before we dream of shadowy space-ships and week-end excursions to Venus or any other planet, let us get down to the humdrum but surely satisfying task of making quickly in quantity and selling quickly in quantity the substance that is within our grasp."

Flying Boats.—The lecturer described himself as an "ardent addict" of flying-boats. When, after, say, a quarter of a century, atomic power was used, it would be essential to use the sea or large lakes as airports.

Meanwhile, however, the way of the flying-boat pioneer was extremely hard commercially. The first operator had to bear the whole cost of the ground-based equipment, and someone would also have to pay for the specialized customs facilities, refuelling, passenger handling and other facilities involved.

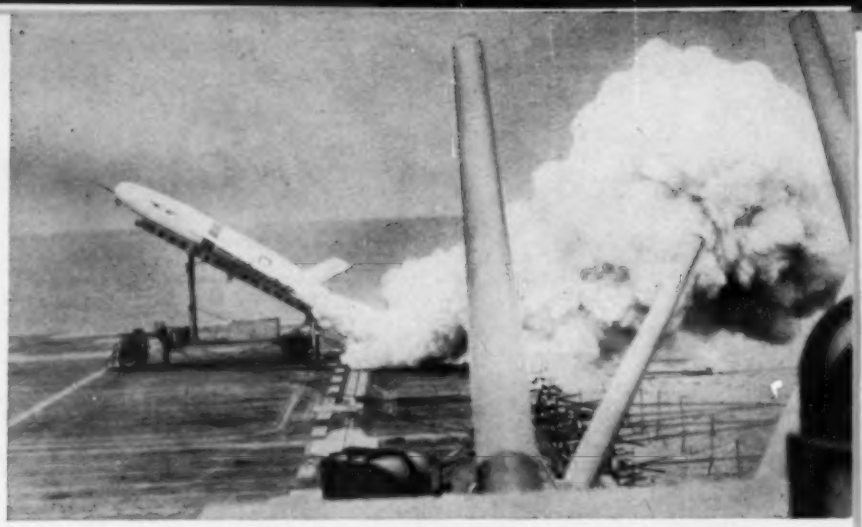
The highly stressed metals of the modern gas turbine had a marked antipathy for salt water, and it would take a great deal of experiment to determine whether the durability of the jet engine in a flying boat would measure up to commercial standards. Problems to be decided included the design of the hull; the shape of the bow-wave and spray in relation to air intakes at take-off and landing; and the effect of wet salt air at moorings. Like everyone else, Sir Miles wanted to see the best possible use made of the existing hulls, and the flying-boat as a type given every chance to develop; but it was not commercially prudent to put all one's eggs into that particular basket.

To Pod or not to Pod.—The lecturer suggested that in the not-too-distant future the virtues of the straight jet would be combined with the good features of the turboprop. Maybe this would take the form of a ducted fan; maybe some other method of gearing the turbine to atmosphere would be evolved. He went on: "I have a hunch that the diameters of engines are liable to be considerably and dramatically altered in this process, and so, I think, we shall be unwise to close our minds to the possibility of designing new aircraft with their engines outside the wing in pods, American fashion, so that a greater degree of flexibility of engine size and characteristics can be accommodated without disruption to a whole fleet."

Targets for Tomorrow.—Sir Miles concluded by outlining B.O.A.C.'s requirements in the way of aircraft capable of operating their world-wide network. Two aircraft were needed, both of which should be able to carry something under 100 first-class passengers but considerably more when fitted with high-density seating: "One of them should fly at 550 miles an hour, both must fit into the existing airport pattern, one should have a stage-length of 4,000 miles (allowing for the usual reserves) and very low costs. Both should have ten-year life and operating costs that will enable them to make a profit with a 45 per cent load factor at present first-class and tourist rates, fuel costs and the like.

"I do not believe that such aircraft are incapable of production for the post-1960 era. If British manufacturers do not make them before anyone else, we shall have sacrificed our heritage."

HERE AND THERE



UP SHE RISES: From a mobile launching ramp, aboard a U.S. aircraft carrier, a Chance Vought Regulus missile gets under way. In actual operations a new smokeless propellant would render the launch less visible. The Regulus can be launched from surface vessels, submarines or land sites.

B-26s For Indo-China

IT was announced in Washington last week-end that delivery of B-26s to the French forces in Indo-China was being accelerated, and that 200 men would be sent to augment the American technical ground-staff already there.

Swiss Venoms?

AUTHORITY to purchase a hundred de Havilland Venoms is being sought by the two Houses of the Swiss Parliament. The Swiss Air Force is at present using Vampires, in addition to obsolescent piston-engined material.

Teutonic Farnborough

GERMANY'S first post-war air display is to be held at Rhine-Main Airport, Frankfurt, from April 10th to 13th. It is hoped that the show will demonstrate the ability of German manufacturers to supply components and accessories to foreign firms.

Unpopular Solution?

OPERATING from a local park, S-55 helicopters of H.M.S. *Perseus* transported 120 men back to the carrier last Sunday as she lay off Bangor, Co. Down. Their liberty-boats had been damaged by a sudden gale. Four helicopters carried batches of six men on each trip.

Adventurous Spirit

FLYING a Mosquito solo, Mrs. Diana Bixby, of California, is shortly to attempt to beat the late Bill Odom's (Douglas Invader) round-the-world record of 73 hours. Engine trouble caused the failure of a previous attempt which she made with her husband, Bob Bixby, in April 1950.

Silence, Sir!

QUESTIONED in the Commons last week about damage alleged to have been caused to property by sonic bangs, Mr. George Ward, Under-Secretary for Air, said that orders had already been issued to all R.A.F. stations whereby pilots must refrain from deliberately causing bangs "except when authorized by stations or at exhibitions or in legitimate and essential forms of operation."

Call Me Madam

PROBABLY not for the first time, the use of the title "flying officer" for a W.R.A.F. flight officer who has qualified for her wings has caused a comedy of errors. Last week the Royal Air Force Club accepted a membership application from a flying officer at an R.A.F. station—only to discover, when Air Ministry Records were consulted, that the "him" was a "her." The club was probably shaken to its foundations, for, like so many of its neighbours in Piccadilly, it confines its membership strictly to the male sex.

Not the Gallant Major

INVESTIGATIONS during the week-end failed to establish the identity of a pilot who flew a Meteor under Bristol's Clifton suspension bridge last Friday.

Canadair Appointments

AS a result of reorganization at Canadair, Ltd., Montreal, Everett B. Schaefer becomes assistant chief engineer, while chief engineers in various sections are appointed as follows: J. M. Schaffer, design; R. D. Richmond, development; B. J. Kaganov, structures; J. J. Waller, material and process; and E. H. Higgins, projects. T. A. Harvie becomes project engineer and H. H. Whiteman assistant project engineer, while S. J. Pope is appointed section chief, aerodynamics.

Forward Thinking on Radio

SPEAKING at the recent London annual luncheon of the Radio Communication and Electronic Engineering Association, Mr. T. E. Goldup (retiring chairman) suggested that constructors should consult the radio industry about navigational aids and communications equipment while new aircraft were still in the design stage. In a subsequent interview he expressed the opinion that such consultation would save many months on the production of new types. The Association's annual report, incidentally, states that "further efforts have been made to secure recognition by the aircraft industry of a standard power supply in civil aircraft." The new chairman of the R.C.E.E.A. is Mr. C. G. White, general sales manager and director of Kelvin Hughes (Marine), Ltd.

"With all this accrued interest, can't make up my mind whether to buy another chain of hotels or give my son an airline pilot's training."

Air-Safety Lecture

THE Cantor Lecture of the Royal Society of Arts on March 1st will be given by A. Cdre. Sir Vernon Brown, former Chief Inspector of Accidents, M.C.A. His subject will be *Safety in the Air*.

From Three Aspects

A TRIO of lectures on the Blackburn and General Aircraft Freighter was delivered to a meeting of the Brough branch of the R.Ae.S. on February 3rd. Under the general heading *The Design, Construction and Flight Testing of the Universal Freighter*, the three lectures were delivered by Mr. C. W. Prower, assistant chief designer, Mr. W. A. Hargreaves, works director, and Mr. G. R. I. Parker, assistant chief test pilot. A summary of the lectures will appear in *Flight* in the near future.

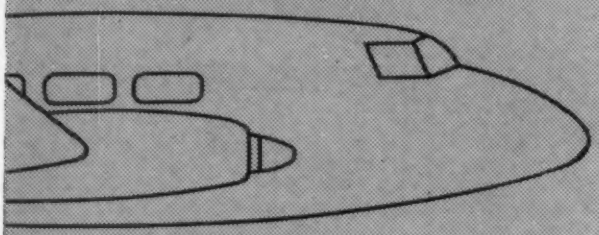
Valiants ex Brooklands

THE excellent take-off performance of the Vickers Valiant is already familiar to Farnborough-goers, but it is not generally known that production Valiants are being flown out of the historic Brooklands airfield, which lies in a "saucer" and has a maximum runway length of only 1,288 yd. Already Mr. G. R. Bryce, Vickers-Armstrongs' chief test pilot, has shown that one of these four-Avon bombers can be unstuck (in nil wind, but lightly loaded) in much less than that distance, and a demonstration by the next production machine is expected within a few days.

Helicopter Service Pioneering

THE world's first scheduled helicopter passenger service was not—as stated last week—that which operated between London and Birmingham; in fact, the first was the Liverpool-Cardiff service which began on June 1st, 1950. The single fare was £3 10s, and a monthly return cost £5 10s. Wrexham was an intermediate stop. On this subject of "firsts," it may be added that the first regular helicopter mail service was between Peterborough and Yarmouth, which began June 1st, 1948, and the first night mail from Peterborough to Norwich, started on October 17th, 1949—in both cases run by British European Airways.

Eland



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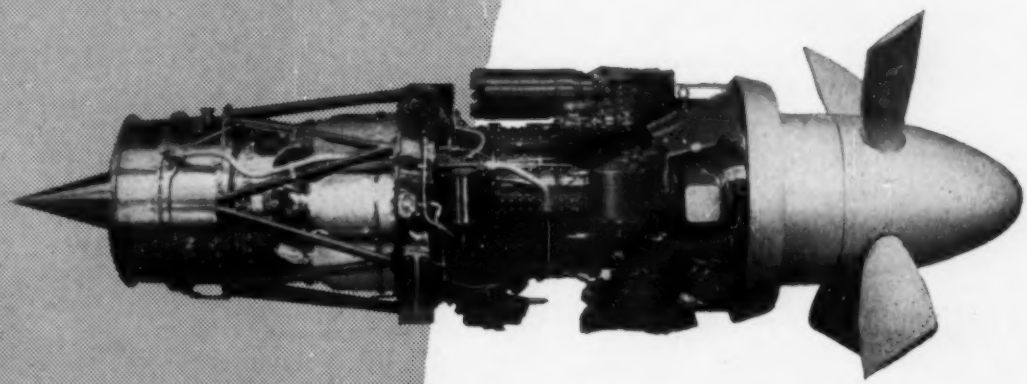

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With TAA it's Goodyear for the Viscount

YEARS of using Goodyear wheels and brakes in particularly severe operating conditions have convinced world airline operators of the fundamental superiority of this equipment. Therefore, Goodyear wave wheels and full circle brakes are now being specified for Vickers Armstrong's " Viscount " aircraft.*

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Wave wheel for long life, low weight and quick tyre changes.

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An artist's impression of the Aircraft Research Association's transonic tunnel, scheduled for completion next year.

FOR TRANSONIC RESEARCH

Details of the A.R.A. Tunnel now under Construction at Bedford

AS forecast in *Flight* of January 8th last, we are now able to give further technical details of the transonic wind tunnel being built by the Aircraft Research Association for the use of its 14 member-firms. It may be recalled that the aim is to use the tunnel for development work on new designs by these firms, and so relieve some of the pressure on Government research establishments. The firms included are: Armstrong Siddeley, Armstrong Whitworth, Blackburn, Boulton Paul, Bristol, Folland, Gloster, Handley Page, Hawker, A. V. Roe, Rolls-Royce, Saunders-Roe, Vickers-Armstrongs and Westland.

The tunnel, which is expected to be complete towards the end of 1955, will have a working section 9ft wide by 8ft high, and in it models of up to 5ft span will be tested at speeds up to Mach 1.3.

The tunnel will be powered by electric motors and a total of some 35,000 h.p. will be required at full load, this being taken direct from the 132,000 volt grid system. Since the tunnel is required quickly, complication in the design has been avoided wherever possible. Provision has also been made on the site for a smaller tunnel, capable of testing models at up to Mach 2.5.

The tunnel is of conventional design, using a closed circuit with a contraction ratio of 11:1 and diffuser angles of about 5½ deg total cone angle. It is being constructed of welded steel, and octagonal sections are being used over most parts of the circuit to simplify construction. A small pressure range of about 0.2 atmospheres above or below atmospheric pressure can be used to enable the Reynold's number, the load on the models and the power required to run the tunnel at a given Mach number to be varied. The additional expense and complication involved in the provision of a wider pressure range was not thought to be justified.

The main fan drive for the tunnel consists of a two-stage fan of 21ft diameter, with twenty blades to each stage. The blades will be made from laminated mahogany and bolted to a metal hub. Provision is being made for a static adjustment of the blade angles over a small range to enable the power to be adjusted to suit the r.p.m. of the driving motor. Flaps are also to be put on the prerotation vanes to control the amount of twist in the airstream ahead of the fan. These flaps will be adjustable while the tunnel is running and will enable the power input, and hence the tunnel speed, to be altered over a small range without any change in the r.p.m. of the fan.

The fan is to be driven by a 25,000 h.p. slip-ring induction A.C. motor with a Ward-Leonard controlled D.C. motor of 1,500 h.p. coupled to it. Coarse control of tunnel speed is obtained by adjustment of a liquid resistance coupled to the rotor of the A.C. motor, but fine control is being obtained by using Ward-Leonard control on the D.C. motor. This method of composite drive is one which has been used with some success on American tunnels and makes it possible to hold the speed of the fan to within 0.1 per cent. The D.C. motor has a large torque at low speeds and will be used to start the fan, the A.C. motor being switched in when the fan has reached about 200 r.p.m. This should avoid the large starting surge usual with an A.C. induction motor.

Provision is being made in the design for the addition of a further A.C. motor and two more stages on the fan if it is required to increase the power input in the tunnel.

In addition to this main power drive there is on the site a 12-stage axial compressor with a 10,000 h.p. motor. This will enable a smaller supersonic tunnel with a working section about 2½ft square to be run up to a Mach number of about 2.5.

Since the tunnel is a closed circuit, the heat equivalent to the power put into the tunnel has to be extracted from the airstream. This is being done by a large cooler, 36ft wide × 30ft high, consisting of a number of banks of copper tubes and fins, and situated in the airstream. Water is circulated through the copper tubes, so removing the heat from the air and keeping it at not more than 25 deg C above the outside air temperature. The water is cooled in a forced-draught cooling tower, the maximum water circulation rate for the whole plant being about half a million gallons an hour.

In addition to the air being cooled, its humidity must be controlled at a low value, otherwise condensation shocks appear in the working section and interrupt the flow over the models. All the air entering the tunnel circuit must, therefore, pass through an alumina drier to remove most of the moisture. The aim is to run the tunnel with a moisture content of less than 0.001 of a pound of water per pound of air, i.e., about 10 per cent of the maximum summer humidity.

As has now become almost standard practice, electrical resistance strain-gauges will be used for measuring the forces on the models. It is planned to test both complete models and half models mounted on the floor of the tunnel. To enable these models to be changed quickly a system of model "carts" has been designed which can be wheeled into the tunnel with the model already mounted on its balance and supporting rig. Since a large number of results can be obtained in a short time, plans are being made for as much automatic computation as possible.

In addition to the tunnel and its associated motor house, compressor house, observation room and other facilities, a workshop is being provided to enable some of the models to be constructed on the site. These models will be made from solid light alloy or, in some cases, steel. Methods of shortening the time of construction will have to be achieved if the tunnel is going to be successful in giving the designer the information he requires at an early enough stage, and various methods of model construction are, therefore, being investigated.

When finally completed the installation will employ a total staff of 80 to 100 people. The tunnel will probably be run on a double-shift basis and it is expected that it should be possible to test up to at least 30 models in a year.

The architects for the buildings were Ley, Colbeck and Partners, of London; main building contractors are Robert Douglas, of Birmingham; the main electric power drive is being supplied by the English Electric Co.; and the tunnel shell has been built by Moreland Hayne and Co., of London, and G. H. Harvey, of Greenwich.

R.Ae.S. ASSOCIATION EXAMINATION

GIVEN below is the pass list for the December 1953 Associate Fellowship examination of the Royal Aeronautical Society. The next examination takes place at about the middle of May.

Part I.—V. Angre, T. O'Brien, J. M. de Wilde (Holland), J. W. Gardner, D. Gill, S. M. Humphrey, J. Klaver (Holland), D. O. Lewis, A. E. Moniz, B. R. Srinivasa Murthy (India), R. A. Nicol, S. L. Relan (India), J. L. Rudkin.

Part II.—W. K. Aiyadurai (Australia), W. B. Blydenstein, E. S. Bradley, J. Burnett, S. R. Cann, A. H. Fraser-Mitchell, D. R. Henbest, T. C. Lee, R. Lewis, W. H. McKinlay, J. McNaughton, W. V. Badri Nath (India), J. G. H. Pearce, N. R. Reddy, D. J. Richardson, D. M. Ridland, S. Singh, T. Singh, D. H. Tipper, I. K. Trundley, F. Walker.

COMETS—AND TRANSATLANTIC PSYCHOLOGY

Some Frank Comments from Canada

THESE views, expressed by a Canadian reader, strike us as being particularly enlightening. Though his remarks on the widespread effect of one kind of British export on the sales of other kinds may at first seem surprising, we have no reason to doubt their truth. Warnings about complacency are familiar, but they cannot be repeated too often.

WHEN, in May, 1952, B.O.A.C. introduced jet travel with Comets, British prestige rose in the eyes of all informed North Americans. It soon became evident that the development of the Comet was one of the greatest advances ever made in aviation. People in the United States were asking themselves why Britain was so far ahead in airliner development. As the months passed, and we learned of the Viscount and Britannia, Britain's lead became more apparent.

As an indication of just how important the Comet had become, not only to those directly concerned with aviation on this side, but to the layman as well, virtually every American magazine of any importance carried either a feature article on the Comet, or at least alluded to it and usually in praiseworthy terms. Among them were such widely read journals as *Fortune, Newsweek, Colliers* and *Businessweek*, to name a few. North Americans read these articles and decided that Britain's aircraft industry deserved a lot of credit for its achievements.

Now, North Americans are strange people in one respect. If one does a good deed or commits a commendable act, he is a "Good Joe." Indeed, almost everything about him suddenly becomes better and his shortcomings are overlooked. On the other hand, if he slips-up or ceases to distinguish himself, he becomes a "square." Perhaps this type of thinking is naïve; yet it expresses, quite accurately I believe, the thinking of many Americans. This "quick to praise and quick to damn" attitude has never been more apparent than when applied to Comets.

But the point of the matter is this: many other British products sold in North America gained added prestige with the advent of this transport. Now Britons do not have to be told how important their export industry is in these crucial times. Thus, the Comet caused the American housewife to choose English china; her husband bought a Jaguar automobile, and her son asked Santa Claus for a Raleigh bicycle for Christmas.

I personally feel that no other single British achievement in recent years has done more to enhance Britain's position abroad than has the Comet and all it implies.

Now let us look at the aviation situation in Britain today. That Britain has the lead in turbine-powered airliners there can be no question. But time is marching on, and her lead is not as secure as it was one year ago. Except for her leadership in civil aircraft, she is not now paving the way as she should be in other phases of aeronautical development. Here are some points worthy of note:—

(1) While the backbone of R.A.F. fighter command is the Gloster Meteor and the American-designed, Canadian-built Sabre, the United States is beginning to re-equip its air forces with more advanced machines such as the Super Sabre and Skyray. These, and other comparable American aircraft, will be in United States squadron service practically as soon as the Swifts and Hunters of the R.A.F. The point here is that the performance of the American machines seems to be superior to that of the British.

(2) Although the prototype Valiants, Vulcans, and Victors are superior to any bomber now flying, a showdown in the near future would find the B-47 carrying most of the burden, with commendable assistance from R.A.F. Canberras.

(3) Britain's leadership in engine development is narrowing. Notwithstanding the fact that British companies have provided the Americans with the basic "know-how" of jet engines, including actual British engines, the fact remains that America is mass-producing a more powerful engine, namely, the Pratt and Whitney J57 with a basic thrust of 10,000 pounds. Certainly, the announcement of the Gyron and other British engines is more than noteworthy; but such units have yet to be installed in an aircraft.

(4) There can be little question that the United States is leading in the development and utilization of helicopters.

(5) Rocket-powered, supersonic, piloted aircraft are an American monopoly.

These are facts which few people would openly dispute. Ever since the Comet first made news there has been a tendency on the part of some Britons towards complacency; the attitude has been adopted that Britain was so far ahead that no one would ever catch up. No one needs to be told how dangerous such an attitude can be. Indications today are that in all phases of aviation in which Britain has undisputed lead the Americans are steadily closing the gap.

Because of this situation I urge you in Britain to continue to develop all phases of aviation to the very limit of your resources. I realize that tremendous financial outlays are required. Nevertheless, I am sure that, because of your present aeronautical prestige abroad, you will find that money spent now will be more than returned, not only to the aircraft industry itself, but to the British economy as a whole through increased exports of all types of British goods.

C. P. B.

INSULATION—BY RICE HUSKS

A NEW material, known by the name of Secondite, was recently demonstrated in London. Developed in Italy during the past 12 years by Mr. Angelo Secondi, it is produced by subjecting rice husks to a patented process which extracts all organic matter, leaving only silica, cellulose and lignin. When compounded with other materials, such as concrete, magnesite or plaster, it can be used for general constructional purposes, or for insulation and soundproofing. In the recent demonstration, the material was shown to possess remarkable flame-resistant and heat-insulation properties. Secondite can also be used for filtration purposes; filters made of it are claimed to be extremely fine, efficient and durable.

The demonstration emphasized various properties of the material. An 8in-thick block of Secondite, pierced by a steel bolt and placed for several hours on a surface at 1,800 deg C remained cool on top: the bolt, though it melted at one end, was cool to the touch at the other. An oxy-acetylene flame was unable to pierce a sheet of the material. A Secondite filter 1¼in thick, suitably placed in a special fuel tank, supplied petrol/air gas suitable for a slightly modified car engine. Such a filter—which, it is claimed, will actually perform the functions of both fuel pump and carburettor—effects fuel economies stated to range between 20 and 40 per cent.

Principal aeronautical applications, suggest the sponsors, lie in the protection of concrete surfaces and carrier decks from jet blast and kerosine corrosion, in soundproofing applications, and in replacing stainless-steel firewalls. Although the material is available in test quantities, it is not yet being produced commercially. An English company, the Secondite Co., Ltd., 25 Millbank, London, S.W.1, has been formed to exploit it with a view to production in the not-too-distant future.

Secondite, which we believe to be a result of Italian wartime research into synthetic materials, is claimed to have almost unlimited applications. Its demonstrated qualities are certainly remarkable, but research carried out to date has not allowed a comprehensive assessment of the material, mainly because of the multiplicity of its applications.

THE AIR MINISTRY ACTS

A DISTINGUISHED audience, including the Secretary of State for Air, Lord De L'Isle and Dudley, V.C., the Deputy Chief of the Air Staff, Air Marshal T. G. Pike, and the Director-General of R.A.F. Medical Services, Air Marshal J. MacC. Kilpatrick, was present at the Fortune Theatre, London, on January 26th. The occasion was a performance by the Air Ministry's Adastral Players of A. J. Cronin's "powerful" three-act play, *Jupiter Laughs*, and a second performance was given the following evening.

The author knows medicine in many aspects, and his story of an embittered but brilliant doctor, who is interested only in research and falls in love with a woman doctor, is authentic and at times moving. The cast at this first performance were not as sure of themselves as we have seen them in past productions, and a certain amount of rather audible prompting intruded on the ear; but to balance this fault there were some telling performances. Particularly noteworthy were Arthur Beckess, Roy Widdup and Pamela Bickell, who made the most of rewarding parts; and Brian Robson and Percival Griffiths presented assured cameos. Production (by Victor Kirby) was, as usual, polished—if a little slow—and music was provided by a section of the Ariel Orchestra, conducted by L. F. Foster.

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MANTLE of SAFETY

Australia's Flying Doctor Service Celebrates Its 25th Anniversary: John Flynn's Vision Realized

By JOHN SIDNEY

FOR Australia's famous Flying Doctor Service it is a happy coincidence that during its 25th anniversary year the Queen should be visiting the Commonwealth; in the course of nearly 10,000 miles which Her Majesty and the Duke of Edinburgh are covering by air, they will see typical areas served by the unique organization whose history and humane work is described in detail in this article. Often operating under the most adverse conditions, its aircraft have been the means of saving hundreds of lives and relieving an incalculable amount of suffering.

TO mark the 25th anniversary of the Flying Doctor Service of Australia, a tenth base is being opened, at Port Augusta in South Australia. Now over 1,000 outback radio transmitters are in touch with ten headquarters radio stations and the dream of the late Reverend John Flynn, O.B.E., D.D., of a "mantle of safety" over the great empty spaces of Australia has reached an even riper fulfilment.

On June 1st, 1929, the first Australian "flying doctor" answered the first radioed message for help. Early in that year, six rudimentary pedal-powered transmitters had been installed at lonely posts in Northern Queensland. The first "flying doctor" had preceded them by over six months.

To Cloncurry in May 1928 had come Dr. K. St. Vincent Welch and pilot Affleck of Qantas. Cloncurry had been chosen as a test area for the infant service because it had a well-equipped hospital in the centre of 250,000 square miles in a sparsely-settled country.

Most Australians live round the coastal belt. In the more arid interior, holdings are often as large as an English county and your nearest neighbour may be half or even a full day's journey away, even by car. Here, in the past, men, women, and children were struck down by illness and accident and died before help could reach them. And here, too, are heat, flies, dust-storms and rough bush roads. Sometimes heavy rains and flooded rivers make transport impossible in the wet season.

Into the lonely centre of Australia in 1911 came a missioner, the Reverend John Flynn of the Presbyterian Church. His territory was between Port Augusta at the head of Spencer's Gulf in South Australia and Oodnadatta, south of the boundary with the Northern Territory. He moved among the settlers—but he was far more than a spiritual comforter. There was no parlour-sitting and tea-sipping for John Flynn. He would help an overworked settler with his tasks; he would hang out the washing or do anything that would ease the burdens of a harassed mother; he pulled out troublesome teeth; he brought comfort to the dying—and he watched them die because aid could not reach them in time. He saw a man with appendicitis rushed 250 miles on the back of a truck and saw him die because neither the doctor who was coming to operate, nor those with the patient, could make a way across the great swollen rivers.

The problem concerned not merely these isolated people in South Australia but those all over the areas of the great continent where people are spread thinly—an area about twice as large as Europe. In the mind of John Flynn, and others of his church, was born the idea of the Australian Inland Mission which would, in Flynn's own words, "spread a mantle of safety" over these people. Flynn was made the first superintendent, in 1912. His plan, at this stage, was to establish a network of nursing homes staffed by trained sisters and doctors. But, even with hospitals and doctors, the distances were often too great—even if floods, dust-storms, and the bad roads did not bar the way.

In 1917, he saw how it could, and must, be done. Medical aid must be brought above the dust and the floods, and the rotten roads. It must come on wings . . .

It may not seem a very significant vision to us now, but in 1917 civil aviation was, to all intents and purposes, yet to be born. Even so, aeroplanes alone could be of little use; and again this far-sighted minister knew the answer—that other new-fangled contrivance, wireless.

He began campaigning. Presently he found allies, men like Hudson Fysh of Qantas. Fysh shared Flynn's vision and his company could supply the aircraft. But the radio transmitter with its power generated by cycle-pedals was a tough problem. It had to be simple enough even for a child to operate, it had to be cheap, and it had to be reliable, needing only a yearly overhaul. Flynn sought help from all over Australia and, though he knew nothing about the still-new science of radio, he resolutely began to study it.

In due course he won over the Australian Inland Mission to his ideas and he finally convinced the doctors, who agreed to a year's test of the scheme. Financial life-blood for this initial experiment came from the generous gift of money from the H. V. McKay Charitable Trust (Victoria). Although, from the beginning, the public called the scheme "The Flying Doctor Service," its first official name was "The Aerial Medical Services of Australia." This description remained until 1942, when the doctors accepted the popular name and "The Flying Doctor Service" became also the legal title.

By 1926 Flynn's dream was half realized. There were doctors and aircraft, but no suitable transmitter. That year, Flynn hired Alfred Traeger, an electrical engineer, to assist him with radio experiments at Alice Springs. The biggest problem was that the pedal generator gave an irregular flow of power, which meant that frequencies were apt to change in the middle of a message. Traeger overcame the difficulty after six months of experiment; then he returned to Adelaide and began to manufacture improved pedal-operated sets in his backyard workshop. The first cost about £A30 each; each comprised a one-valve transmitter and a two-valve receiver. They were W/T. sets, which meant that operators had to learn the Morse code before they could use the sets. Traeger offered to install the sets and to teach the owners the code.

The first Flying Doctor, Dr. K. St. Vincent Welch, took up his large practice from Cloncurry base in May 1928. No radio sets had as yet been installed. Advised by telephone and telegram of illnesses, Dr. St. Vincent Welch flew over 20,000 miles to attend 255 patients in his first year of practice.

By the end of that first operational year, six sets had been installed and on June 1st, 1929, the first S.O.S. came from Augustus Downs, a lonely outback homestead. It was now clear that the Aerial Medical Service must go on and there must be

(Left) The late Rev. John Flynn, founder of the Flying Doctor Service. With him, pointing to a map of the radio coverage (as it was some five years ago) is Dr. John Woods, one of the medical officers whose experiences are mentioned in the article. (Right) A patient, brought in by a Rapide, is transferred to an ambulance at the Wyndham base in N.W. Australia.

MANTLE OF SAFETY . . .

Linking the Flying Doctor organization is the radio equipment by which the remote homesteads call for assistance. For many years pedal-operated generators, as seen here, have supplied the power, but car batteries are now tending to replace them. (Right) A doctor gives first-aid advice by R/T. before flying from his base to attend a patient.

more Flying Doctors and more bases so that the "mantle of safety" would cover the entire outback of Australia.

There had, of course, been opposition. Some said, "The Flying Doctor will only look after the boss." And others, again, "It's only the Presbyterians that will get looked after." But soon it became clear that "the mercy plane" knew neither riches nor creed nor colour: it brought succour to all—from the grazier's wife to the newest baby of the aboriginal stockman.

Some graziers, too, had resisted the idea. But soon there was a growing folklore about stubborn men who reluctantly installed the new gadget and within a week had to use it either to save their own lives or that of their wives or children.

Then came the depression, and the Australian Government withdrew money it had been paying regularly towards the upkeep of the service. But the Australian Inland Mission refused to be discouraged, and soon the Queensland Government helped to finance the work. Private citizens also came to the rescue.

In 1933, Victoria formed its section, and the scheme began to broaden into a national organization.

Thereafter the mantle spread steadily until today there are the ten bases—at Cloncurry, Charleville, Charters Towers, Broken Hill, Alice Springs, Kalgoorlie, Port Hedland, Meekatharra, Wyndham, and the latest at Port Augusta.

In 1951, the then nine bases of the service made 936 flights, covering 264,462 miles.

In addition to the Flying Doctor Service of Australia there is a Flying Ambulance Service at Ceduna, in South Australia, operated by the Bush Church Aid Society of the Church of England. The Commonwealth Department of Health, also, operates a Flying Doctor Service based on Darwin and covering the northern portion of the Territory.

Looking back for a moment, it is important to add that in 1934 Traeger had begun to experiment with radio-telephone equipment; the first R/T. sets were produced in 1935 at a cost of about £A50. This was an important development. Gone was the troublesome Morse code, and the inland people rushed to buy the new sets. These had a range of 1,000 miles and the lonely outback was no longer quite so lonely: homesteaders could talk on these sets to their friends residing half a continent away.

Pedal sets are still in use in some districts today; but they have generally been superseded by equipment consisting of a four-valve transmitter and a five-valve receiver, powered by a six-volt car battery. This type costs £A165.

De Havilland Rapides are used extensively in the service today but much of the work is being taken over by the newer Drover, built by the D.H. Australian company and powered by three 145 h.p. Gipsy Major 10s. This sturdy aircraft, with its stout fixed undercarriage, can land on rough or improvised strips and can take off in 500 yards in still air. For its size and engine power it has a big carrying capacity (1,500 lb payload), and it costs only about 5s an hour to maintain; upkeep is a consideration, with the Service's limited funds. [This average maintenance figure is meant literally: 5s an hour, 24 hrs a day, parked or airborne.—Ed.]

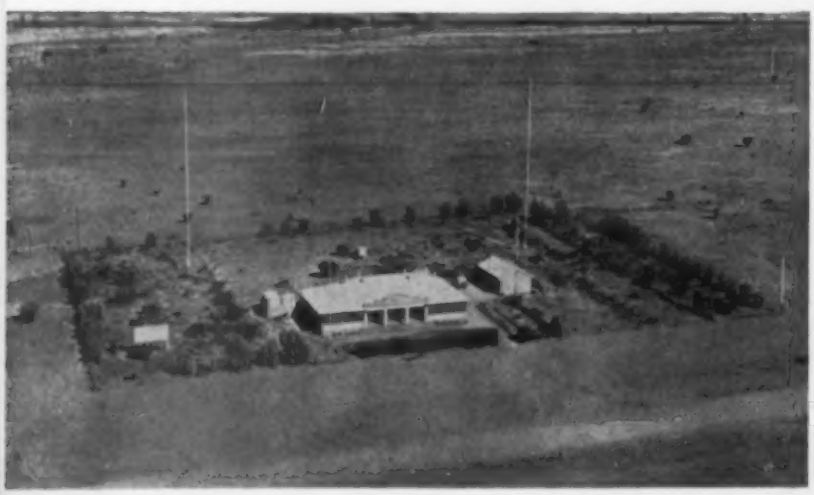
The Flying Doctor Service has had an extraordinary record of safety, in spite of the hazards involved. This has been achieved by stringent maintenance inspections and by the skill of the pilots. Many times the call of humanity has made it necessary to ignore safety rules. For instance, most of the back-country strips limit landings and take-offs to one direction, no matter which way the wind may be blowing. Rules provide that the pilot must not take off into a cross-wind of more than a certain velocity, or when the strips are wet. The hazards are obvious: a soft patch may throw an aircraft on its back at 80 m.p.h., or a tyre may burst as a heavy cross-wind tries to shear the machine from its undercarriage. But outback patients do not wait for calm or dry weather before they break their legs or develop appendicitis; the bush pilot has to take a risk and trust to his skill.

Flying conditions often deteriorate after the aircraft is safely airborne and returning to base. Dust, which can blot out the ground completely, is the pilot's worst enemy. Navigational aids are becoming available, but in many areas it is still a matter of contact flying—flying that implies the use of instinct, knowledge of local conditions, a mental picture of alternative landing strips, and a close watch on the fuel supply. Often it means the strong chance of a forced landing at last light because of inability to reach an airfield in daylight. In the final analysis, the pilot has to make his decision unaided.

Just what pilots may have to attempt is illustrated by the experience of pilot Selwyn Woolcock of the Broken Hill section. One night, he flew an aircraft loaded with a kibble (an ore bucket) and other mining gear, with two miners, to try to rescue a man buried by a fall of sand when sinking a bore-hole. People scattered along the route to Bootra, where the disaster happened, helped by lighting fires to guide the pilot. One man offered to set fire to his barn; others shone headlights. Said Woolcock: "We just followed the lights for 160 miles. It was like going up Broadway."

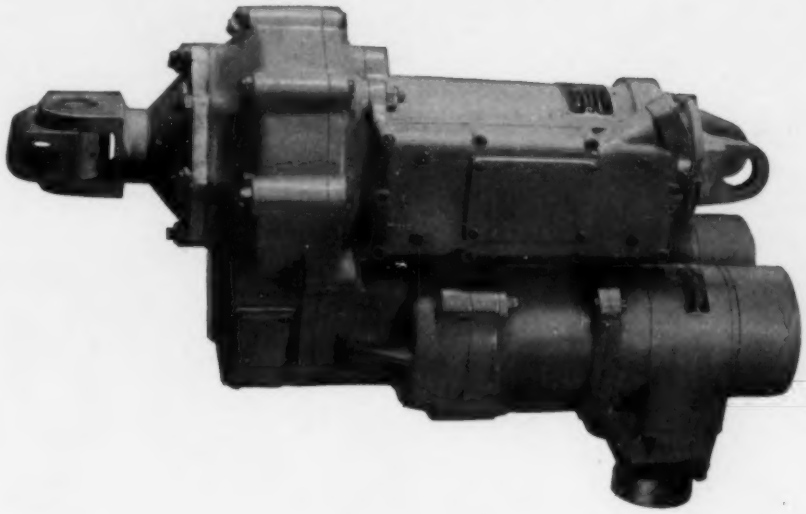
Again, a call may come from an area vaguely describable but not to be found on any map. Once a tractor driver became ill and an emergency call was sent on a pedal radio. The driver was working for George Alder, a man who excavated dams on outback property on contract. Alder tells the story of how he guided Woolcock to the sick man somewhere in that empty space known locally, and appropriately, as "The Three Corners of Death":—

"We didn't know exactly what portion of the map



The Flying Doctor base near the big mining centre of Broken Hill, N.S.W., is to be visited by the Queen on March 18th.

ACTUATORS



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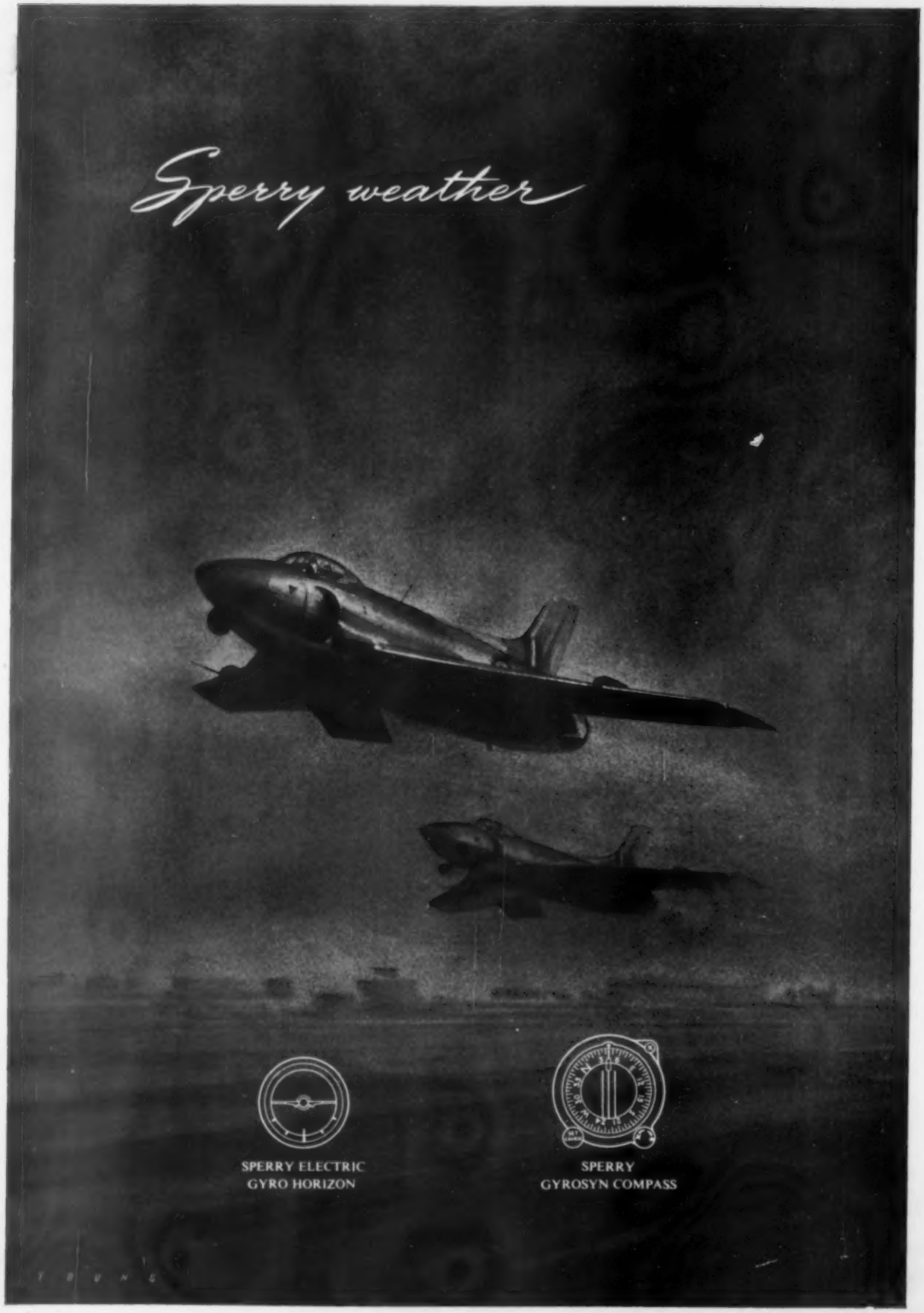
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MANTLE OF SAFETY . . .

we were on. We could only say we were about 50 miles north of So-and-so and about 70 miles south-west of some other place. There was no way of pin-pointing our locality because the names in that area had never got on the maps.

"The Flying Doctor and pilot came out. It's always O.K. with Woolcock. He kept in touch with me from the plane and described the places passed over. I would reply, 'We are still north of that place.' He was able to judge that he was getting closer by the increasing strength of my signals. At last he travelled over, and described, a creek I knew to be ten miles east of us. I directed him to turn and follow a certain watercourse, and at last was able to report, 'Now I can see you coming straight towards us.'

"With our earth-moving equipment we had improvised a runway and he came in and made a perfect landing."

A recent flight made from the Alice Springs Base in Central Australia to the Hermannsburg Mission (a Lutheran aboriginal mission) was made in almost impossible flying conditions. General dust-haze had reduced visibility to less than one mile and actual dust and sand blowing locally gave visibilities of from nil to 200 yards at Alice Springs and Hermannsburg and other points in between. Surface winds of 50 m.p.h., and gusting higher, threatened to render landing, taxying and take-off even more difficult. But the flight was made (and with success) because it was considered that the patient would have died if he were not brought in immediately.

Much of the work of the doctors is, of course, less hazardous and may consist of diagnosing a child's cold or measles by radio-telephone. All of them are skilled in long-range diagnosis and sometimes a minor operation has been "performed" by remote control.

Dr. John Woods, then stationed at the Broken Hill base, once set a dislocated shoulder 400 miles away. A workmate of the patient followed the doctor's instructions step by step; and just after the last of a series of orders, Dr. Woods heard the voice from the other end say, "The bone has just clicked back, doctor!"

How is the service financed? By grants from Federal and State Governments and private gifts, and by revenue. In one recent year, the New South Wales section cost £A11,300 to operate. Its total revenue was short of that amount by about £A1,800. An important source of revenue at all base stations are the radio-telegrams received from people in the outback and relayed to the outside world. In that year, the New South Wales section received about £A1,000 from telegrams. Patients are not charged for medical flights, but, as the cost of a long flight can amount to £A70 or £A80, those who can afford to contribute are asked to do so; some outposts donate the proceeds from the sale of stock.

The Reverend John Flynn, who had seen his dream come true in his lifetime, retired from the Australian Inland Mission in 1950, after a ministry that had lasted for 40 years. Six months later, at the age of 71, he died. His body was cremated and the ashes taken to the Central Australia he had served so well. He sleeps under Mount Gillan near Alice Springs. Over the grave is an eight-ton round stone brought from 250 miles away.

It is one of the huge granite monoliths, almost perfectly spherical, at which the traveller marvels as he passes up the Great North Road between Alice Springs and Tennant Creek. John Flynn passed "The Devil's Marbles," as these monoliths were called, many times; they were one of his favourite camping spots. A bronze tablet, set in the plinth, bears this inscription:—

> Beneath this stone rests the ashes of
> "Flynn of the Inland"
> 1880-1951
> THE VERY REVEREND JOHN FLYNN
> O.B.E., D.D.
> First Superintendent of the Australian
> Inland Mission 1912-1951
> Founder of the Flying Doctor Service
> Moderator-General of the Presbyterian
> Church 1939-42
> *"He brought gladness and rejoicing to the wilderness and solitary places."*

PRIZES FOR FARNBOROUGH STUDENTS

As briefly recorded in our columns last week, Sir William S. Farren, president of the Royal Aeronautical Society, presented the prizes at the Royal Aircraft Establishment Technical College on February 1st. Sir William, who was introduced to the large audience by Mr. A. A. Hall, Director of the R.A.E., said it was ten years ago that he last undertook the task of presenting the prizes at this College. At that time few indeed could have foreseen that the College would make such tremendous progress. Its reputation in the world of aeronautics was extremely high, and he felt some sense of personal pride in the fact that he had been a member of the first committee formed to guide the future of the College. Sir William spoke modestly of his own contribution, saying that much of the credit for the far-sighted early planning should go to three men whose names all began with the letter "P"—Professor A. G. Pugsley, Mr. W. G. A. Perring and Mr. R. D. Peggs. Professor Pugsley was the first chairman of the committee, Mr. Perring the Director of the R.A.E., and Mr. Peggs the Principal of the College. The speaker said he felt, too, that they had gained much from the support of Sir Archibald Rowlands [Permanent Secretary, M.o.S., 1946-52].

Speaking of education generally, Sir William thought that to teach a trainee really to like work was more important than trying to teach a multitude of subjects. He himself had always enjoyed work, and because of his fondness for it had trained himself as an engineer at an early age. His first intention had been to become a good electrical engineer; it was not for some years that he began to take an interest in aeronautics. He disagreed with the idea that one should make up one's mind about a chosen career early in life and stick to that career: work should be interesting and exciting and cover a very wide platform. When a love of work was in evidence the question of whether it was hand or brain work no longer loomed important. The fiftieth year of flight had brought to mind the Wright brothers, who were the perfect answer to all who would argue on this question, for they had combined both types of work with outstanding success.

Presenting his report on the year's work, Mr. R. D. Peggs, Principal of the College, gave a brief summary of examination results. These included:

Twelve B.Sc.(Eng.) Final; 12 B.Sc.(Eng.) Part 1; 31 Higher National Certificates in mechanical engineering; 14 endorsements to H.N.C. in mechanical engineering; 18 completely exempt from A.M.I.Mech.E. examinations; 22 H.N.C.s in electrical engineering; 12 H.N.C.s in production engineering; 13 Ordinary National Certificates in mechanical engineering, and 25 endorsements; 10 O.N.C.s in electrical engineering, and 19 endorsements; 44 Final City and Guilds, 1st class; 46 Final C. and G., 2nd class; 12 Intermediate C. and G., 1st class; 43 Inter. C. and G., 2nd class; three first places in Final C. and G.; four C. and G. prizes in aero engineering; five Higher National Certificate Institution prizes; a King George VI Memorial Fellowship to U.S.A., valued at 2,500 dollars plus tuition and travelling; and two reserve candidates for this Fellowship.

In addition, there were three M.o.S. post-graduate scholarships, nine local education authority post-graduate scholarships and two technical State scholarships. The Llewellyn-Howell Memorial Trophy was awarded to the College by the Worshipful Company of Turners.

At the conclusion of the proceedings Mr. A. J. Robinson, president of the R.A.E. Technical College Students' Union, presented a gold watch to Mr. Peggs. A token of the regard of past and present students and apprentices, it marked the tenth year of Mr. Peggs' office as principal of the College.

Sir William Farren presents a prize to student J. Thwaite. Seated near the end of the table is Sir Frederick Handley Page. Standing, left to right, are Mr. R. E. Smith (Vice-Principal), Mr. R. D. Peggs (Principal) and Miss A. J. M. Stewart. At the extreme right is Mr. A. A. Hall.

AIRCRAFT INTELLIGENCE

LONE SENTRY: Over 90 Lockheed WV-2 Super Constellation radar pickets are now coming into full service with the U.S. Navy. They carry nearly 15,000 lb of radar to about 30,000ft, at which height the aerials can "see" many times farther than at sea level. The dorsal set measures elevation and the belly radome (the largest plastic part ever made) contains a bearing antenna with a transient power of several million watts. ANAPS-20 search radar is carried, with APS-42 cloud-collision equipment in the nose. These Turbo-Compound aircraft have a crew of 31.

Great Britain

D.H. 110. When this great fighter first appeared, published rumours suggested that it would be named Vixen. A French journal has now stated that it is being developed as the "Sea Vixen," and that a pre-production series of five is on order.

English Electric Canberra. Pending the arrival of later, and much modified, Canberras, the B2s now in service are being improved in efficiency by various additions; for example, extra stores racks have been added under the wing tips. Two or four racks are carried, and a machine with four rockets mounted on the port-wing racks was illustrated on p. 460 of our October 2nd, 1953 issue (this aircraft also had two tanks, or stores pods, under each wing). All the latest modifications are incorporated in the new RA.7-powered Canberra B.6, now in production at Preston, a photograph of which appears on p. 195. In America, preparations are under way for production of the tandem-seat Martin B-57B; as an economy measure, 33 B-57As have just been cancelled.

Westland Whirlwind. As we illustrated last week, production WS-55 Whirlwinds are becoming available in quantity. For the Royal Navy, the Whirlwind HAR.1 (subject of this week's three-view drawing) is a sea/land rescue machine, also used for ambulance, communications and transport work. The Mk. 2 for the R.A.F. is a search/rescue aircraft, with secondary rôles of communications, light freight (including external loads), paratrooping, supply dropping, and visual reconnaissance. The Wasp may be replaced by the Wright R1300 radial.

United States

Convair B-36J. Strategic Air Command B-36s are generally being modernized and developed for photo-reconnaissance, and specialized purposes such as FICON carrying (acting as mother-ship to an F-84F fighter/atom bomber. At the same time, the ceiling is being steadily raised and is now limited both by power and stalling speed, at a height greater than that for any other American aircraft. The B-36J is the latest, and probably the ultimate, bomber variant. With a revised bomb bay and landing gear, it carries a greater load, and has a take-off weight of up to 450,000 lb.

Convair Sea Dart. At San Diego, Convair have a number of F2Y Sea Darts in the erection stage. It is thought, however, that the design will be abandoned owing to the Westinghouse engine difficulties; the J46 turbojet, two of which are fitted, is not cleared for service and no other engine fits the airframe. At present Sea Dart orders are limited to 50 aircraft.

Convair YF-102. After most unfortunately losing the first prototype of this large Mach 2, delta-winged intercepter, following power-failure at take-off, Convair have now got the second machine well established in initial flight trials. This second prototype is slightly different from the first, and various stability and control troubles, which at one time looked serious, are reported to be largely solved. The production F-102, which is reported to have been named Machete (a long, heavy knife), will be an electronically controlled all-weather intercepter, armed with Hughes F-98 Falcon missiles. If it proves really successful, this aircraft may render an all-weather F-100 Super Sabre unnecessary.

France

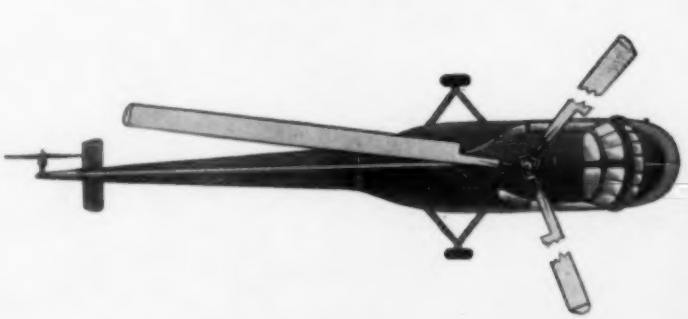
S.N.C.A.S.O. 9050. From the S.O.9000 Trident rocket-propelled experimental aircraft has been developed a supersonic fighter with this designation. Two Tridents were built, one of them crashing and seriously injuring test pilot Jacques Guignard, who is now recovering. The S.O.9050 will have a large S.E.P.R. rocket in the tail and wing-tip turbojets to provide cruising thrust. Air-to-air rockets will be carried. It is probable that the Trident control system will be retained, i.e., single all-moving tailplanes with anhedral, a conventional rudder and no ailerons.

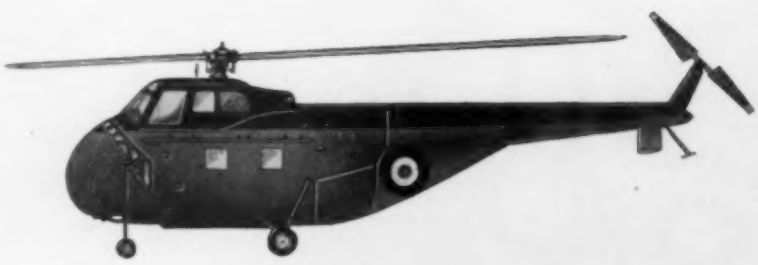
U.S.S.R.

Mig-15. A French journal asserts that these modifications have been made to the basic Mig-15: a two-seat all-weather development; a dual-control trainer; a folding-wing variant for carrier work (Russia is not known to have any modern carriers); an afterburning version; an experimental machine with variable sweepback; another with a thrust-reversing jet deviator; and another with an auxiliary, fuselage-mounted ramjet.

WESTLAND WS-55 WHIRLWIND HAR.1
(Pratt and Whitney R1340 Wasp)

Rotor diameter	... ...	53ft.
Overall length	...	62ft. 1¼in





Air Power at Sea

H.M.S. EAGLE

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Much of the Navy's striking power rests in her carriers, the great majority of whose aircraft now as hitherto are of Fairey design and construction.

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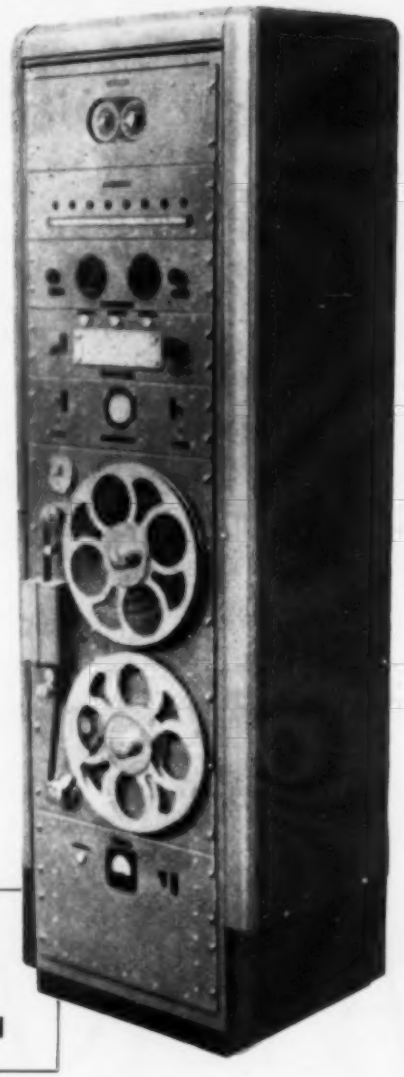

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2nd T.A.F. today

WITH R.A.F. VENOMS AND SABRES IN GERMANY

By W. T. GUNSTON

READERS will recall two previous accounts of the Allied Air Forces, Central Europe, which appeared in our issues of June 26th and August 28th last year. This third narrative deals with Britain's own part of AAFCE, the 2nd Tactical Air Force, which is itself part of the 2nd Allied T.A.F. With the 4th A.T.A.F. this latter formation makes up the operational strength of AAFCE, which has its international headquarters at Fontainebleau, near Paris. The 2nd A.T.A.F. includes a high proportion of the air forces of both Holland and Belgium, and the strength of these latter forces has increased at least threefold during the past two years. But the present article is intended to focus attention on the British force.

Our air force in Germany stems from an earlier 2nd T.A.F. which played a major part in tactical operations over the whole of northern France, Belgium, Holland and Germany, until V.E. Day, on May 8th, 1945. On July 15th of that year this wartime formation was disbanded and its personnel and equipment used as the nucleus of the British Air Forces of Occupation, whose duties included policing the British Zone of Germany, and such diverse functions as "de-Nazification," screening captured documents and equipment, forming the German Civil Labour Organization—which absorbed many ex-Luftwaffe men—and initiating reconstruction of airfields and installations.

B.A.F.O.'s first major "real" test was provided by the Berlin Air Lift of 1948-9, and nearly all the British military and civil participation was controlled by B.A.F.O. headquarters. Emerging as an organization of proven efficiency, B.A.F.O. gradually became more closely connected with the friendly air forces in neighbouring territories, so paving the way for its absorption into the integrated NATO force which was then being planned.

It was actually on April 2nd, 1951, that Gen. Lauris Norstad, U.S.A.F., arrived at Fontainebleau with his historic directive from Gen. Eisenhower—who was then Supreme Allied Commander, Europe—bidding him fashion the allied air element into "a single, integrated force." His plan for achieving this end was the division of the Rhine area into northern and southern halves, with a distinct allied T.A.F. responsible for each half.

On September 1st of that year the British Air Forces of Occupation were re-named 2nd Tactical Air Force, and the post of C-in-C. was taken over the following month by Air Marshal (now Air Chief Marshal, retired) Sir Robert Foster, K.C.B., C.B.E., D.F.C. Before concentrating entirely on this force it is worth noting that the national components of 2nd *Allied* T.A.F. were originally the 2nd T.A.F. (British), the H.Q. Tactical Air Command and Nos. 311 and 312 Squadrons (Dutch) and the second Belgian wing, consisting of Nos. 1, 2 and 3 Squadrons. These were reorganized on an international basis as No. 69 Group (Lowlands Air Defence) which was jointly Belgian and Dutch, No. 83 Group (British/Belgian) and No. 2 Group (British/Dutch). So much for the administrative picture.

When the Royal Air Force became established in Germany in 1945 its principal operational commander was the late Air Marshal Sir Arthur ("Mary") Coningham; we believe it was his discerning eye that picked out most of the Service's future headquarter sites and general disposition. It would be hard to find any more pleasant country than that around Bad Eilsen (near Bückeburg, shown in the sketch-map) and, in this former spa, the R.A.F. in Germany has had its headquarters during the past eight years.

For policing an occupied territory it is convenient to disperse air units fairly uniformly through the length and breadth of the entire area, and this resulted in our occupation of stations as far apart as Jever, Wahn and Fassberg. During the past few years, long-term strategic thinking has caused a change in emphasis from policing duties to acting as a deterrent against any attack from the east—which is, after all, one of the principal aims of NATO. As we related on August 28th last, most of the Allied Air Forces in Central Europe have been pulled back to the Rhineland, where they occupy new airfields financed out of international moneys and specially designed to support powerful tactical forces.

Rather surprisingly, the British 2nd T.A.F. has not pulled back an inch. It is true that it has its fair share of new NATO bases—of which more will be said—but, unlike the force comprising the 4th A.T.A.F. in southern Germany, 2nd T.A.F. is still operating from such forward airfields as Fassberg—G/C. E. M. Donaldson's stronghold for many years—which is, as the Meteor cruises, under five minutes from the Russian Zone. Various reasons are responsible for this arrangement. There is no doubt that the R.A.F. is better "dug in" in Germany than its neighbouring occupying air forces have been; there is close co-operation with local authorities and traders, and much reliance is placed on the effective German Service Corps, successor to the G.C.L.O. mentioned above. It is also fairly certain that the 2nd T.A.F. is more truly mobile than any other air force on the continent; if necessary, it could pack up and move almost without notice, taking all its operational equipment with it.

But it should be noted that, at the present time, the international headquarters for 2nd A.T.A.F. is being established near München-Gladbach, up near the point at which the frontiers of Germany, Holland and Belgium meet. Here, Air Marshal Sir Harry Broadhurst, K.B.E., C.B., D.S.O., D.F.C., A.F.C., recently appointed commander of both 2nd T.A.F. and 2nd A.T.A.F., is setting up a united team of staff officers from all three nations—something which he might not have been able to do had the H.Q. remained at Bad Eilsen.

Although all types of aircraft may be seen in the British Zone as a result of exercises, 2nd T.A.F. is, and has always been, equipped solely with tactical machines. Originally these were the Spitfire, Tempest, Mosquito, Meteor and Vampire; today these

2nd T.A.F. today . . .

are partially replaced by the Sabre, Venom, and NF Meteor; and other new equipment, such as the Swift, is hopefully awaited. Reconnaissance Meteors are standard equipment, and other types frequently based in Germany have included such diverse machines as Lincolns, Canberras and Balliols.

The performance of most of these types is well known to all; possible exceptions are the Venom and Sabre, and the following is an amplification of some notes which we made during a recent visit to see these types in action.

There are now several complete wings of de Havilland Venom F.B.1 single-seat fighter/bombers in Germany. Not a great deal has been heard of the Venom actually at work, and it is frequently thought of as "just a glorified Vampire." In fact, the Venom is a machine of remarkable quality and, now that its introductory "bugs" have been worked out, it has become a most valuable machine. This journal presented (on October 3rd, 1952) the first account of a Venom unit at work in Germany—a flight of F.B.1s under the command of S/L. D. H. Seaton, D.F.C. Until fairly recently this officer has been in command of the first squadron to receive the type, and we talked with him at some length at the ex-Luftwaffe airfield of Wunstorf.

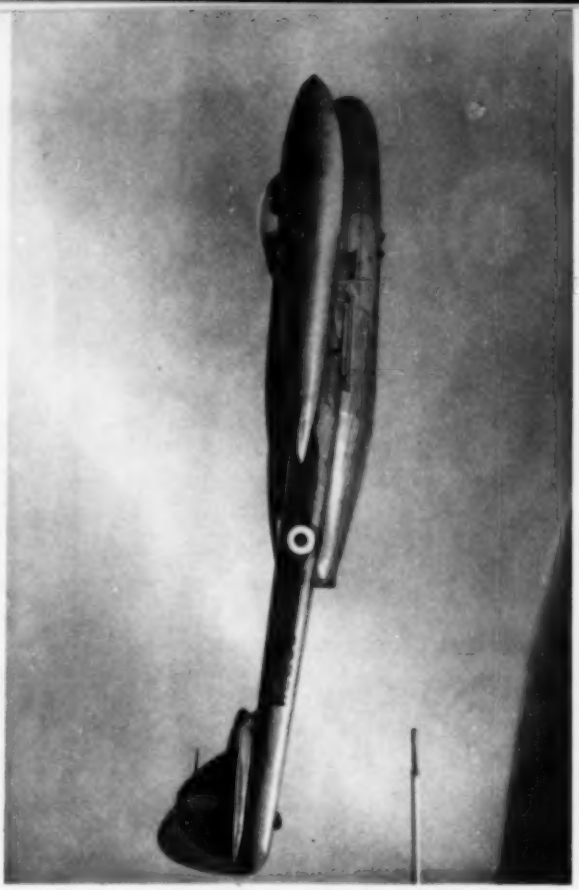
He told us right at the outset that the Venom was a very popular machine. Both as an interceptor and as a ground-attack aircraft it was outstandingly good, and could be thought of as a most effective compromise between the load-carrying Thunderjet and the transonic Sabre. Seaton was not at all perturbed at the thought of engaging combat with swept-wing machines; with tanks off, he said, the Venom is a first-rate fighter—and at heights above about 35,000ft it has hardly an equal (a view we have heard expressed by officers from several countries). The rate of climb also marks a significant advance on the machines it is replacing.

A g-suit is considered essential—"otherwise," said the squadron leader, "you lose your No. 2 every time." He went on to praise the heating and refrigeration systems, which were so vitally necessary. The dangerous bogy of hood-icing had never been met on a Venom; the hot-air anti-icing system was, in fact, so powerful that it had sometimes cracked the first sandwich of the windscreen. The refrigeration, also, was an absolute boon which made a real difference to the pilot's comfort and efficiency: "At last," said Seaton, "we can fly on low-level operations without having to hang our shirts on the line afterwards."

The military Ghost, which with bifurcated intakes gives about 4,850 lb thrust, is standing up well to the strenuous treatment meted out to it. At present there is no Ghost in service with an afterburner (it was at one time assumed that such an engine would be used on the Venom) but the present unit is perfectly capable of handling the Venom under all conditions.

The cartridge starter, in particular, came in for a special word of praise; we ourselves watched several pairs of Venoms come to life with a characteristic cartridge roar, and in every case the machines were airborne post-haste. Both the pilots and ground-crew approved of the Dowty fuel system, the self-contained control unit of which was preferred to the previous arrangement of separate fuel pumps, valves and barostats.

In spite of its much greater all-up weight, the Venom has a considerably better take-off than its predecessor, the Vampire. Most of the Venoms in Germany have lifted heavy loads from ice, sand and snow surfaces, and they can be worked from any strip which might conceivably come its way. Landing is assisted by the low stalling speed—by modern standards—and the powerful brakes, although the thin, high-pressure tyres somewhat reduce the effectiveness of the latter. In the air, the Venom climbs at an exceptional rate and angle, and is highly manœuvrable. Even with the earlier pattern of fin it keeps very steady, and is a first-class platform for guns and rockets. Ejection seats are now standard in the single-seat Venom F.B.1, and the first aircraft so equipped arrived at Wunstorf during our visit.



A few days previously the aerobatic team of S/L. Seaton's squadron had paid a visit to Madrid, where they took part in a flying display. Although "a show for connoisseurs" their performance had gone down very well, and brought the crowd to its feet. Flying to Madrid had accentuated the difficulty of navigating so fast a machine without modern aids; and, typically, the Madrid homer was off-the-air during the flight down, for it had been "siesta time."

The Venoms at Wunstorf looked excellent, and showed few signs of their rough treatment. Paint, however, was peeling—as it usually does when subjected to rain at 500 knots.

Wunstorf is a well-established ex-Luftwaffe airfield, and the

Conversion Flight Sabres at Wildenrath—with peeling insignia.

de Havilland Venom fighter/bombers are agile mounts, as the photograph on the left shows. On the right, one gets away from Wunstorf. Below, the fastest and slowest machines in the air force, at Wildenrath; the Tiger is a prized hack.

R.A.F. have been its tenants for nearly nine years. But our next call was to be upon a very different airfield—the great new NATO base of Wildenrath, built during the past two years and home of the 2nd T.A.F.'s Sabre conversion flight, as well as various Venom and Sabre regular squadrons. Like most of the new NATO airfields, Wildenrath lies in the region of Germany's western frontier —in this case on the frontier with Holland. Once we had reached the autobahn, it was a matter of sitting back while the 2nd T.A.F. Volkswagen reeled off the kilometres, traversing the entire Rühr in the process.

It was dark when we arrived at Wildenrath and, although it was Sunday night, Sabres were in the circuit. Once beyond the guardroom, we began to appreciate the size of the place; we continued to drive for several minutes, through roads cut straight through the dense fir forest, before coming upon buildings recognizable as such. We began to feel sorry for Wildenrath airmen on "jankers," picturing them marching for hours in the rain on their way to the guardroom.

Preliminary encounters with the few occupants of the officers' mess soon made it evident that we were guests of a highly efficient and hard-working station, in the command of G/C. J. E. Johnson, D.S.O., D.F.C., the top-scoring R.A.F. pilot of the war. His is an exceptionally full-time job, but he found time to talk to us the following morning.

Of the Sabre itself, much has been written in this journal, and it suffices to say that those of 2nd T.A.F. are generally standard Sabre F.4s, with the General Electric J47. They mount six 0.50in guns, and are equipped to carry 16 rockets under the wings. The group captain had under his command a number of regular fighter squadrons, equipped with camouflaged Venoms, Sabre F.1s and F.4s, and also the dozen or so aircraft of the Sabre conversion flight which, as the photographs show, are unpainted.

They were, he said, thoroughly new, and the sturdiest aircraft he had ever known. The station had had Sabres for about three months at the time of our visit, and an 80 per cent serviceability record had been maintained, largely by cannibalizing other Sabres. "Now," said the C.O., "proper spares backing is available, and we are flying them all day."

From G/C. Johnson and from squadron pilots we gathered that the Sabre is doing all that had been expected of it. Its controls

Domestic attention for fighter/bomber Venoms at Wunstorf.

Left, a line-up of Sabre F.4s of a regular squadron. Above, a Conversion Flight machine is refuelled from a huge German-built bowser.

2nd T.A.F. today...

are exceptionally positive—almost dangerously so to a pilot fresh from an earlier fighter—and there are no vices. Many of the original pilots and ground crew at Wildenrath had been to the U.S.A. or to the R.C.A.F. base at North Luffenham for training. The station is well served by maintenance men, who enjoyed "every modern convenience" to help them in their job. In fact, to resort to a cliché, morale is high.

Flying conditions at Wildenrath, and its giant neighbours Brüggen and Geilenkirchen, are fair. The approaches are flat from the Rhine 35 to 40 miles to the east, and from the Dutch coast, so that very low QGHs are possible in bad weather. On the other hand, several pilots spoke of "clag from the Ruhr" which can blanket the region for days. The Sabre is well-equipped with aids, and no pilot has ever become lost. A radio compass is standard equipment, and beacons and commercial radio stations are almost too numerous. Other aircraft and airfields are on the air continuously and one Sabre pilot reported that he had been talking to West Raynham while in the Wildenrath circuit. One telling point was that, as the big NATO bases are so close together it is essential to fly accurate circuits; this problem is eased by the fact that every base has an east-west runway, and the landing patterns consist of a series of parallel dumb-bell shapes. Nevertheless, it was widely held that a master control centre was needed.

The runway at Wildenrath is rather smaller than usual, being "only" 2,700yd in length. Fully loaded, the Sabre F.4 can get away in about two-thirds of this length in all temperatures; on landing, the R.A.F. Sabres approach at 125 kt, i.e., 15 kt slower than does the U.S.A.F. No damage had been caused to any aircraft when we saw them, apart from one burst tyre. The fuel used is Avtag, as the bowser photographs proclaim.

With the exception of the Sabres of the conversion flight, illustrated here, all 2nd T.A.F. machines are camouflaged green and grey, with grey undersurfaces. The principal reason for this is the fact that a silver aircraft is vulnerable on the ground and cannot be screened from air attack. The Canadair Sabres supplied to the R.A.F. were repainted in England by Cellon to a civil contract, after which the extensive stencilling was re-applied. In addition squadron markings are well to the fore, usually taking the form of coloured noses and banded tails. A more recent innovation (as far as the R.A.F. is concerned) is the stencilling of the pilot's name beside the canopy (or, in the case of the NF 11s, the names of pilot and navigator). But it is very discreetly done, in comparison with the style accepted by some other countries.

Before leaving Wildenrath, we looked into the crew-room of one Sabre squadron, to see everyone deeply engrossed in painting the squadron crest on their recently issued British crash helmets. This headgear, which was dealt with in our issue of December 4th last, is of quite different construction from the standard American P.1 Lombard helmet, which many of the Wildenrath pilots had used previously. A good feature of the British product is its greater comfort arising from the bulges over the ears which accommodate the R/T. headset of the inner helmet without undue pressure. Discussion of crash helmets provoked a lively controversy, a few pilots—especially those who had fought in Korea—preferring the Lombard. For the British helmet, adaptors are fitted to enable the American radio sockets to be retained in the Sabre cockpit. The oxygen mask is the American pressure-breathing model.

After leaving the "built-up area" of the station, we explored some of Wildenrath's outer fastnesses. The farther we went, the more impressed we were, and, having spent the preceding week with other air forces farther south, we came to the conclusion that the R.A.F. compared favourably with any other NATO force, and had a better approach to many problems.

Unlike American NATO bases, Wildenrath has no permanent control tower. In fact, almost everything of an operational character appeared to be either highly mobile or else underground. The basic layout followed that of the other NATO airfields, a typical design being illustrated on p. 251 of our issue of August 28th last.

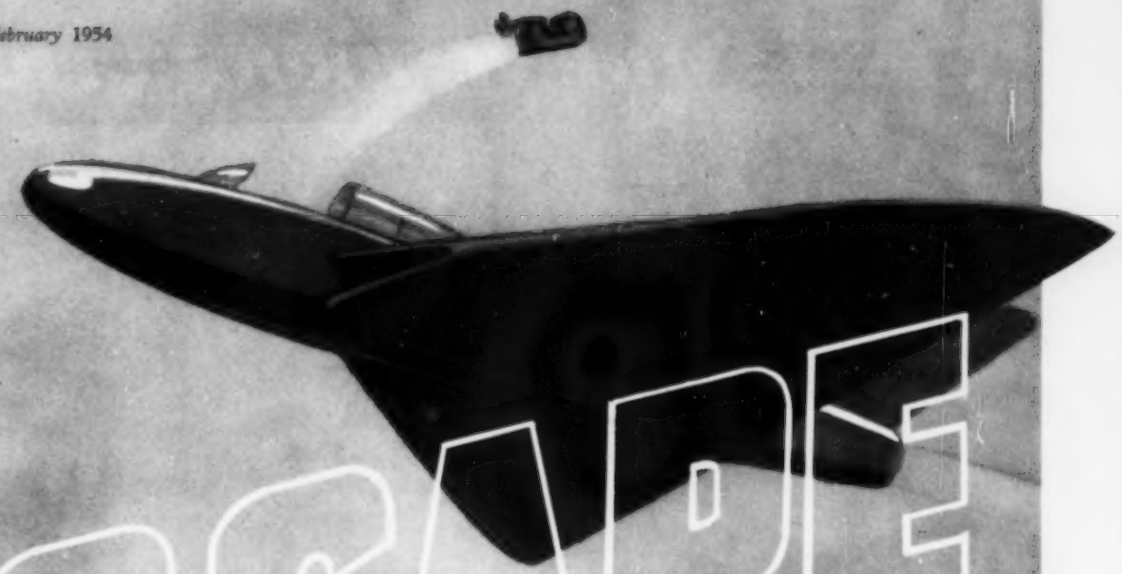
Wildenrath's basic operating platform—to use NATO terminology—consists of a 2,700yd runway and a parallel taxi-strip (which can act as an emergency runway), both of which extend across the Dutch frontier. Chequered caravans are to strafing aircraft like red rags to a bull; although such a caravan was in use during our visit, Wildenrath has additional underground control huts, of which nothing can be seen but Perspex cupolas. The smooth surface resulting from the special runway treatment had caused some Sabres to skid slightly on a number of occasions. Experiments were in progress to see whether pebble-blasting could produce a rougher surface.

The standard NATO airfield is designed to "scramble" fighters at the highest possible rate, from main and emergency runways. Wildenrath's Sabres would, once airborne, be under the control of the air-traffic control centre and ops. room, both of which we found permanently housed in caravans. Close by was a mobile G.C.I. station, all these facilities using electric power generated on the spot. Bulk fuel and other installations were situated underground. R.A.F. Regiment detachments were permanently sited around the station, these being similarly housed in self-propelled vehicles. Communications were maintained by land-line and raido-telephone between all departments. In emergencies, the whole station could have been packed up and put on the road—or, to some extent, airlifted out—and a reserve of M.T. was available for all personnel.

The aircraft themselves were parked in widely scattered dispersals, closely tucked away in the dark fir forest out of which the station was cut. There, they were well protected by carefully designed revetments. Of the station's aids to flying, it can be said that everything needed was provided. Calvert cross-bar approach lighting was fitted to the runway at both ends.

To a visitor whose personal identification with the Royal Air Force ceased in 1948, these new German bases make an imposing sight, and one that would do more to boost R.A.F. recruiting than could any number of posters. Broadly speaking, the 2nd T.A.F. are looked upon today as Britain's first line of defence; they certainly deserve—and are getting—first-line equipment.

TAILPIECE: This is almost the only part of a Sabre upon which expensive squadron crest transfers can be retained.



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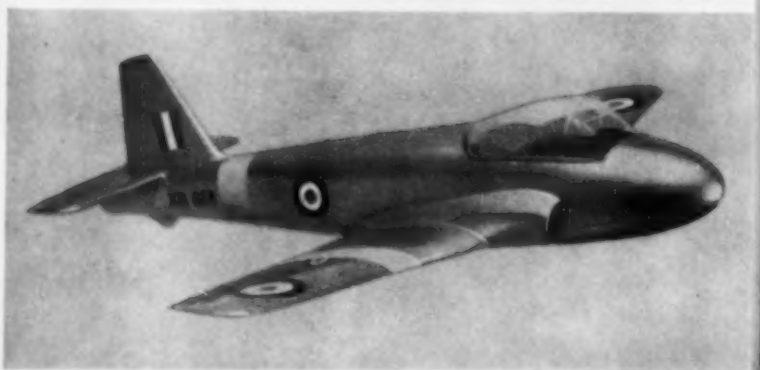

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Heat Problems in Aircraft Structures

Points from the Institute of Physics Conference on Thermal Stress

AERODYNAMIC heating in supersonic flight, and its consequent problems of engineering physics, were discussed at a conference on thermal stress held at the University of Bristol last month. The meeting was organized by the Stress Analysis group of the Institute of Physics, and was reported briefly in our issue of January 8th. We give here an extended summary of the papers presented on this occasion.

On the opening day of the conference, delegates were welcomed in an introductory address by PROFESSOR A. G. PUGSLEY, head of the University's Civil Engineering department. After recalling points he had made at the 1952 conference of the group, Professor Pugsley went on to express his hope for the development of "a new mechanics" in the field of structural materials—a mechanics of deformable bodies more general than the Theory of Elasticity. This new concept would include non-linear deformations and the effects of time and temperature, and its development would be assisted by the work of the present meeting.

The study of the compressibility of gases and the development of the theory of thermodynamics provided an analogy with the growth of this new mechanics, Professor Pugsley continued. Hooke's law of stress and strain, and Boyle's of pressure and volume, were similar in that both were primarily static laws. The position had now been reached where a mechanical equation of state for a deformed body could be written down. This corresponded to Van der Waal's equation of state—the "gateway to thermodynamics."

At this time, he went on, when there existed these new possibilities, the interest in non-linear problems of structures must be widened, and the theory of creep looked at anew. Materials must be assessed not only on the basis of mechanical strength and stiffness, but also on thermal properties, while the study of fatigue must be extended to include thermal effects.

The speaker then turned to consideration of non-aircraft topics (the construction of buildings and ships) in relation to the subject of the conference. He said that the building problem of making a fire-resistant floor, i.e., a load-carrying structure that was non-inflammable and whose strength, stiffness and thermal properties were such that very high ambient temperatures could be withstood for an appreciable time without catastrophic damage, was however of direct interest to aircraft technicians. Examples showed that in addition to the possibility of changing materials, many existing materials and structural techniques could be retained provided the structures were covered with materials of low thermal conductivity.

In conclusion Professor Pugsley suggested that not only was a new mechanics likely to emerge, but the physics of metals (one of the newest branches of science) was likely to become of great importance to the aeronautical engineer later in this century.

The next speaker was DR. P. B. WALKER, head of the Structures Department, R.A.E., who gave a general review of the subject of kinetic heating of aircraft structures. He pointed out that structures subjected to kinetic heating were affected in two principal ways. First, the materials of construction tended to deteriorate with increase in temperature, losing both strength and stiffness; second, internal stresses were produced due to temperature gradients set up within the structure. These two problems, he said, must both be tackled together. Design ingenuity was needed rather than clever theoretical studies.

The survival of the pilot, the operation of his equipment, and other factors, depended upon artificial cooling. The use of artificial cooling together with insulation offered a great potential for the control of thermal conditions. Quite thin layers of insulation, Dr. Walker claimed, had radical effects. The rate of heat transfer to the structure was reduced, and the smaller quantity of heat received by the internal metal structure was more rapidly disseminated. This device reduced the thermal stress due to transient conditions and delayed but did not prevent the overall temperature rise.

MR. K. B. CHAMBERLAIN, of the Engine Division, Bristol Aeroplane Co., Ltd., then reviewed the subject from an engine manufacturer's standpoint. He emphasized a point which Dr. Walker had suggested—that the intelligent approach was not to solve a problem, but to ensure that the problem did not exist. He gave examples of how the engine designer did so, and he stressed the importance of the technique of controlled conductivity by the application of high-conductivity sandwich techniques; he also mentioned the adoption of ceramics and metamics.

The fourth paper of the session (*The Problem of Thermal Stress in Aircraft Structures*) was presented by MR. E. LOVELESS and MR. A. C. BOSWELL, of the English Electric Co., Ltd., Warton, who explained the mechanism of kinetic heating, and listed the heat sources and heat sinks in an aircraft. The next generation of fighters, they claimed, would be able to maintain supersonic speeds long enough to heat the structure to a uniform temperature. Deep anodic treatment should be further investigated as a means of providing the necessary thermal insulation, and information on the properties of materials at elevated temperature under short and long time loadings was required. In addition, a knowledge of the cumulative effect of heating on materials should be sought. The change in moduli at elevated temperatures, it was suggested, would influence strength and aeroelastic behaviour.

In conclusion, the authors described lines of research which they considered should be carried out. Foremost in this programme was the measurement of temperatures and stresses under actual supersonic flight conditions. This implied much instrument development.

The Engineering Background to the Thermal Problems of High-performance Flight was then discussed in considerable detail by MR. D. RENDEL, of the Mechanical Engineering Department, R.A.E. He repeated the remarks of previous speakers regarding the temperature restrictions on crew, radar, fuel and structure, and emphasized in particular the problem of transparent canopies. At a Mach number of 2, Mr. Rendel said, a medium sized aircraft would need some 100 h.p. for the cooling of crew and equipment. As speeds rose in excess of this the cooling power would tend to approach the required propulsive power, and it was necessary to consider whether the heat capacity of the aircraft itself could not be utilized in some way. For instance, the speaker said, on an uninsulated aircraft structure the temperature would rise from -60 deg C to $+80$ deg C in about $3\frac{1}{2}$ minutes at $M=2.0$, but this time could be increased to about two hours by covering with a one-inch layer of fibreglass.

The second session of the conference was opened by MR. I. L. G. BAILLIE, of the Bristol Aeroplane Co., Ltd., with a paper which described tests his company had carried out on materials and structures at elevated temperatures. He emphasized that for components which encounter significant kinetic heating for only a short period, proving tests must be made with rapid heating to temperature followed by rapid mechanical loading to failure.

The heating techniques which could reasonably be expected to reproduce loadings of comparable intensity to kinetic heating were then discussed in a paper by Mr. W. H. Horton, of the R.A.E. Structures Department. He concluded that radiant heating was probably the best source of power, but that Radio Frequency heating should be developed for the years to come.

MR. A. J. SOBEY, of R.A.E. Structures Department, ended the first day's programme with a paper (*Thermo-elastic Similarity*) in which were considered the fundamental requirements for models to be used by designers for preliminary studies of structural problems arising from kinetic heating.

The second day's proceedings were opened by DR. E. W. PARKES, of the Cambridge University Engineering Laboratory, whose paper concerned the design of wings for minimum thermal stress. He considered the problem from the aspects of both aircraft and missiles, and showed by his analysis that in each case it was better to have a composite wing consisting of a steel skin and an aluminium internal structure.

He restated the case for insulation as a device for reducing thermal stress, and said that in a particular example which he had investigated a layer of insulation only 1/1,000 of the thickness of the wing had reduced the thermal stress level by 16 per cent and had doubled the time for the peak values to be encountered. He corrected a mistaken idea of some members of his audience when he stated that thermal stresses depended almost entirely on the difference between initial and final temperatures of the external surface and not on the time taken for this change to occur.

PROFESSOR W. S. HEMP, head of the Department of Aircraft Design at the College of Aeronautics, then presented his paper, *Theoretical Methods for the Analysis of Thermal Stress*. This paper consisted of the extension of the Theorem of Stationary Potential Energy to include temperature effects, and a generalization of Castigliano's theorem of Stationary Energy to include the thermal dilation. The use of these theorems was then demonstrated by application to simple thermal problems.

The work of the Mechanical Engineering department of Imperial College was reported by DR. R. D. HOYLE and MR. E. JAMES. Their work, they said, was concerned with the reduction of the running up period before operating a turbine at full power. The

HEAT PROBLEMS IN AIRCRAFT STRUCTURES . . .

basic theoretical and practical work which they reported was, however, applicable in other fields. They indicated how a step-by-step technique could be used to derive the temperature distribution throughout a plate when the boundary temperatures were known, and confirmed that they had successfully used Bakelite gauges for the measurement of steady stresses at temperatures up to 130 deg C.

This paper concluded the third session of the conference. The fourth and final session was opened by MR. G. MEIKLE, Metallurgy Department, R.A.E., who discussed the effects of temperature on a number of materials used in aircraft construction. The materials which he considered were D.T.D. 364, D.T.D. 683, L 42, En 24, En 25, En 26, En 110 and S 11. Although these were not primarily designed for use at high temperature, the advent of supersonic aircraft and missiles might cause these materials to be used in structures subjected to kinetic heating. A knowledge of their properties was therefore desirable. The duralumin type alloys (e.g., D.T.D. 364), he demonstrated, had a strength loss at elevated temperature which was independent of time as long as the temperature was not greater than 150 deg C. Between 150 deg C and 300 deg C, however, strength rapidly altered and time had a pronounced effect. At 200 deg C, one hour's heating caused a strength loss of 28 per cent, but 1,000 hours' heating caused a loss of 70 per cent. Once the temperature exceeded 300 deg C approximately, he said, the bad effect on material properties was so great that time had very little influence.

The high-strength zinc alloys, as represented by D.T.D. 683 (5 per cent Zn), showed very similar properties, Mr. Meikle said, but in this case the rapid strength fall took place at about 120 deg C. On the other hand, for temperature tests up to 350 deg C, the results which were available on alloy steels indicated that length of time at temperature had no appreciable effect. This difference in properties was due to the fact that the precipitation which occurred in the aluminium alloys was not experienced in steel to any appreciable extent.

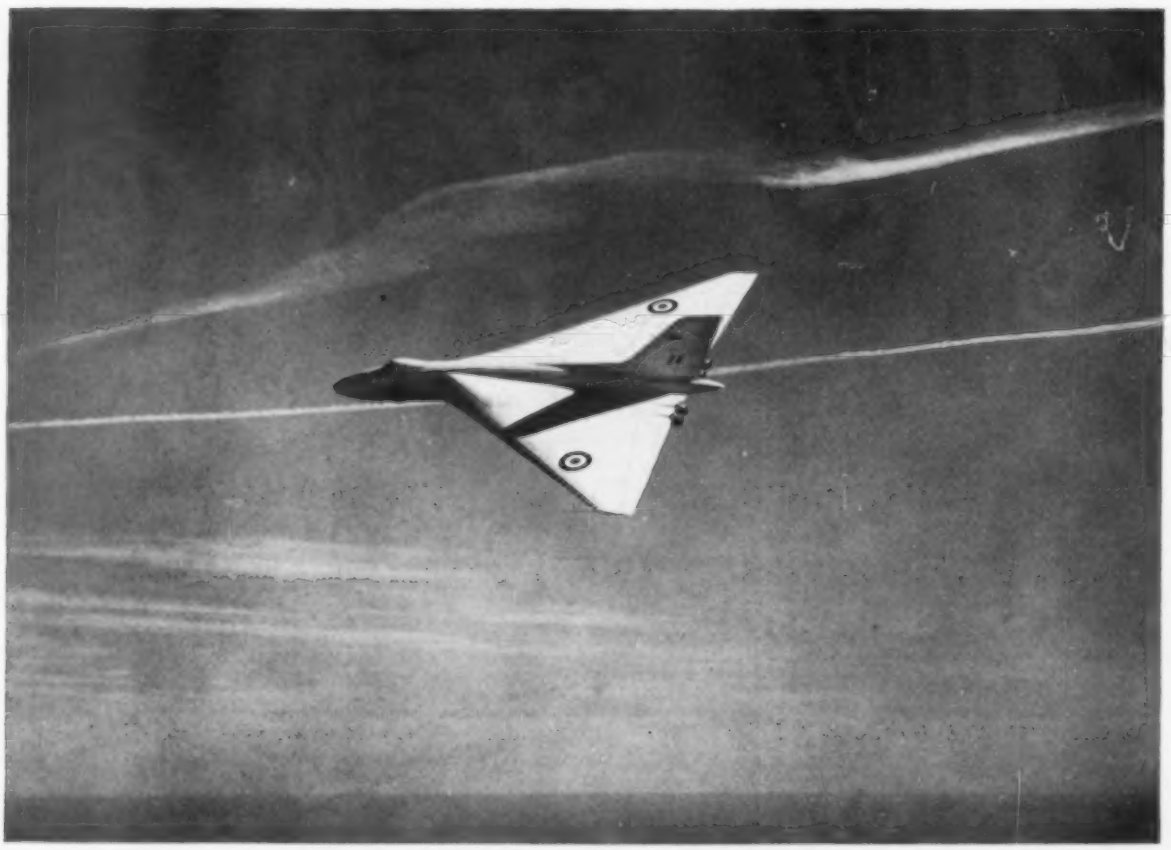
Mr. Meikle was followed by MR. D. A. DREW, Vibrations Department, Rolls-Royce, Ltd., who gave the group a review of high-temperature strain gauges. He explained how a gauge capable of operating, say, at 150 deg only could be used for applications which required a higher-temperature unit. This had been accomplished by connecting the gauge to a tube, through which cooling fluid was circulated, and then attaching the tube to the specimen almost in the same way as a normal extensometer. Woven-type gauges, Mr. Drew said, were still in their infancy but the glass weave was most useful as a device for holding the wire in place while the gauge was being attached by means of a suitable ceramic such as Quigley Blue. It was considerably more difficult, he said, to obtain accurate values of steady stresses than of vibratory ones.

Subsequent to the lecture it was remarked from the floor that Quigley Blue cement made glass very brittle and Mr. Drew agreed this was the case. This embrittlement, he said, was a drawback at the point at which the glass-covered leads left the gauge, although it was not significant as regards the glass fibres in the gauge itself.

The final paper of the conference was presented by MR. B. J. TERRELL, of the Pametrada Research Station, Wallsend. He emphasized the great importance of confirming calculation by practical measurement. He demonstrated with slides a number of interesting techniques which had been used in research measurements made on steam and gas turbine machinery.

The committee of the Stress Analysis Group, and in particular the organizing secretary, Mr. V. M. Hickson, are to be congratulated on the success of this conference. The papers presented combined a high technical standard with interesting presentation.

VULCAN RIDES THE TRAILS



This fine new air-to-air impression of the Olympus-Vulcan was taken at the modest altitude of 12,000ft by Avro photographer Paul Cullerne, flying in a Lincoln. The V-bomber was being flown by test pilot Roly Falk. This aircraft and its Sapphire-powered counterpart are now engaged on intensive test-flying concerned with the development of their military equipment.

HELICOPTER FORUM

Some Further Questions and Answers from the Helicopter Association's Brains Trust

LAST week, under the above title, we gave a number of the questions asked at the Brains Trust held in London on January 22nd by the Helicopter Association, together with summaries of the answers by the team of experts. This team consisted of Mr. L. G. Frise, technical director and chief engineer of Percival Aircraft, Ltd.; Dr. G. S. Hislop, chief designer, helicopters, of the Fairey Aviation Co., Ltd.; Mr. K. Reed, chief helicopter test pilot of Saunders-Roe, Ltd.; Mr. J. Shapiro, aviation consultant and previously chief technical officer of the Cierva Autogiro Co.; and Mr. R. H. Whitby, performance and analysis manager of B.E.A. Mr. Raoul Hafner was prevented at the last moment from attending, and his place was taken at short notice by Dr. Hislop. The Editor of *Flight* occupied the Question Master's chair.

Below we deal with the remainder of the submitted questions, and the panel's replies to them; finally we summarize a number of questions put "from the floor," together with the answers.

In view of the high operating costs and length of time taken by even experienced pilots to become proficient on helicopters, do the team consider that a synthetic trainer would be a practicable aid? If so, should there be a simulator for each type of helicopter or a general-purpose trainer; and in either case, should the simulator be built for visual or instrument flying, or both?

MR. REED said that he thought it was wrong to say that considerable training on helicopters was required. That point had been overdone. There were now a number of helicopters being operated, and consequently more pilots were being required than in the past. One of the best examples to take was the Royal Navy. So far as their helicopter pilots were concerned they were fully operational after 30 hours. He did not intend to give the impression that 30 hours was enough for a civil operator, but an indication of a certain standard reached in that number of hours. He did not think that a simulator would be of any great advantage. With more stable helicopters it would be much easier.

MR. WHITBY said that B.E.A. liked to rely on more than 30 hours before putting anybody on the job on h[illegible] own; they felt it should be the best part of 100 hours. Simulators were very expensive things and one had to have more or less "a production of pilots" before one could justify them. They obviously would not give a pilot primary training in helicopters. They might help to convert him to a certain type and save time, but he would actually need to do the exercises in a real aircraft—not just an armchair.

In view of the recent statements in the Press concerning Sabena's expanding sphere of activities with their passenger-carrying helicopter services, does not the team think that in order to avoid being left at the post it would be better for B.E.A. to operate immediately with well-tried American helicopters, pending the arrival of suitable British ones?

DR. HISLOP said he was in a cleft stick. Sabena were expanding their services, and he thought they would be followed by other European operators. According to a Sabena operations executive it was a good proposition for the time being. Very much to his personal regret, he thought it would be some time before there were British helicopters available to carry passengers economically over the networks which were envisaged, and it meant that B.E.A. stood in a position to find their traffic being filched by the other operators. Their problem, then, was whether to stand by their decision to keep the nucleus of their knowledge in being and then to expand, or to hold fire until British designs came along. It was a very difficult question to answer off the cuff, but he had a feeling that it might be best to extend their operations with larger helicopters and attempt a more economical service if they could find a suitable traffic pattern. They ought to do that for the next couple of years, because otherwise the rate of experience would die away and they would find themselves at a disadvantage when the time came when British helicopters were available.

MR. WHITBY said that at this very moment there were no well-tried American helicopters suitable for the job, but at the rate of development it was likely they would be available before British types. If there was any possible means of speeding up development of suitable British transport helicopters he would be delighted.

MR. REED said he did not understand Mr. Whitby's remark on no well-tried American helicopters. We must remember that they were using American aircraft. He asked if their degrees of safety were lower than British requirements? Mr. Whitby replied that the question was of a large transport helicopter—larger than the ones we were using at present, which, incidentally, were British. He thought that twin-engine safety was an absolute essential for any extended helicopter services which could get into city centres and had any hopes of being commercial. If the helicopter did not make use of its slow-speed properties it was obviously less efficient.

DR. HISLOP said that any British helicopter competing in European networks with Sabena would have to go across the sea. Sabena used S-55s and operated across the land all the time. Should an engine fail a helicopter could put down on land. If B.E.A. endeavoured to keep abreast they must cross the water, and to schedule services regularly across the Channel on one engine was a very difficult operation to take on.

Does the panel consider that slow-speed, high-lift, fixed-wing aircraft constitute a serious threat to helicopters employing the same engine or engines?

MR. FRISE thought it possible to do practically the same job with the same engine in the two types of flying machine. One could carry the same payload and fly the same distances with the same fuel, but in one the minimum speed was about 38 m.p.h. and the other it was zero. The extra structure-weight that had to go into the fixed-wing aircraft to make it come as near as 38 away from zero had used up what would normally be the extra payload that could go into a fixed-wing aeroplane. One accepted the fact that the helicopter, flying sideways on a propeller and being rather a crazy affair altogether, was not so efficient as a fixed-wing machine; but the moment one tried to make the fixed wing come nearer to the helicopter one sacrificed the difference.

MR. SHAPIRO agreed entirely. He thought it much more sensible to go to the helicopter for everything from zero speed.

Do the panel regard noise as a problem, and if so, what do they intend to do about it, on behalf of people outside the helicopter and those carried in it?

MR. FRISE said that the yardstick used in the South Bank tests showed, surprisingly, that the existing method of using a piston engine with normal exhaust system was unacceptably noisy. He would have imagined that people who commuted daily in tube trains would have become toughened to noise. Noise had become a kind of modern Aunt Sally for constituents to consult their M.P.s about, and therefore there would be regulations laid on.

There was no question that there were methods of making the helicopter less noisy. Already experiments had been made to demonstrate that a gas drive could be less noisy. The total energy being put through a low-pressure gas system gave less noise internally and externally than would the small proportion of exhaust from a free-turbine drive. That, it was hoped, would soon be demonstrated completely, and not just by calculations.

The helicopter only started to earn its keep when it pottered about in built-up areas where a lot of ratepayers lived. He had recently come across a case where a certain company in America started a route from the centre of a typically skyscraperish town. Within a week all the tenants of these big blocks of offices went in a body to the mayor and said they were going to pack in at the end of the week if it were not stopped; and it was stopped. That was one example of people who paid money to occupy premises in a big city objecting to the sudden introduction of the noisy helicopter. Noise was a talking-point, and designers must face up to it from the very conception of the job.

Questions "From the Floor"

THE first question was with regard to the application of the turboprop power unit to the single-rotor helicopter and the provision for anti-torque at the same time. MR. FRISE said that the turboprop power plant with a rotor being driven instead of an airscrew was a next step, and it would take its place in helicopter development. A lot of thought was being given to the matter, but he believed there was no question that the free turbine, with the weight of clutches avoided, was the obvious next step. There was a shortage of turboprops in the power range which could be expected to go into existing helicopters immediately. He did not think that the jet exhaust would contribute greatly to planning or that it could be used easily for overcoming the torque of the drive.

To an additional point regarding the part which blade-tip

HELICOPTER FORUM . . .

propulsion would play in development, Mr. Frise added that tip drive by some form of jet was already well known, and there were examples flying. The logical course was to try to produce air or gas at an economical compression ratio and pass the whole lot out to the tip. There were the usual difficulties, as with any new developments; in this case the most efficient pipe to lead the gas out to the tip was too big to be the best aerodynamically. So, as always, a compromise had to be made.

Part of the compromise with this sort of power was its simplicity. One could get perhaps half of the available fuel energy into effective use in driving the rotor, whereas with the free turbine one probably got three-quarters of it. To offset this were the costs of development, the need for gear reductions, and maintenance costs; he thought that an overall benefit in favour of the free turbine could be shown on the operating cost of the finished vehicle—in spite of the fact that less of the available energy would be obtained. This, however, would have to be proved.

Summarizing, it seemed that the extra fuel consumption associated with any form of jet drive could be counteracted by lower installed weight, better disposable load, fewer parts, and cheaper maintenance. The jet would undoubtedly find a home in the helicopter.

A second questioner felt that in the matter of the large passenger-helicopter we seemed to be "fiddling about with a large number of very interesting but unduly advanced ideas," and in the meantime Rome was burning. He asked the Panel's opinion as to what sort of helicopter could be produced most quickly to fulfil broadly the specification recently put out by B.E.A.

MR. SHAPIRO replied that he had been associated with multi-rotor helicopters—three rotors, to be precise—and this work had been a means of utilizing existing experience on small machines in order to build larger ones. He believed this was the quickest way of producing a large helicopter.

DR. HISLOP thought we found ourselves in a situation where we must try to produce a large economical helicopter which would be attractive to operators. We could not afford to go through teething pains, and fall behind the Americans, with the orthodox. We must try to "do a Comet" on them—to attempt to jump the years which we had lost and to get an advanced design which would be attractive and economical and make up the leeway. If as a country we followed the lines indicated by Mr. Shapiro, we might produce a large helicopter a little more quickly, but he doubted if it would be attractive to operators.

Another questioner asked for the team's views on the possibility of rotor blades being replaced by something in the form of a slotted disc. MR. WHITBY said that such a system would have very high solidity, and the engine would need to provide a very large profile-drag torque. It would also have to be a rigid rotor, with attendant problems. High solidity with normal blade-loading would lead to a very high disc-loading, and thus a high power-off rate of descent. In other words, if the blade loading were kept normal the machine would have very poor autorotational characteristics. He added that he did not think this was the best way of doing things, or even an efficient way.

In answer to a question regarding the optimum number of blades for a main rotor DR. HISLOP remarked that he could not just give an answer off the cuff; it depended upon design requirements. In general, one tended to have the fewest number of blades which would do the job. One was driven to increase the number of blades in order to reduce blade loading. To meet Naval specifications one tended to have a lot of blades; for the most efficient lifting capacity, very few. It would depend entirely upon the job that was being done and the design limitations.

MR. WHITBY said that a lot of blades tended to improve the smoothness of the rotor. For the same blade-loading and a number of blades the individual blade would be working at a lower Reynolds number. It was a matter of obtaining a nice balance. Different designers had different views, and it was structural rather than aerodynamic considerations which decided things.

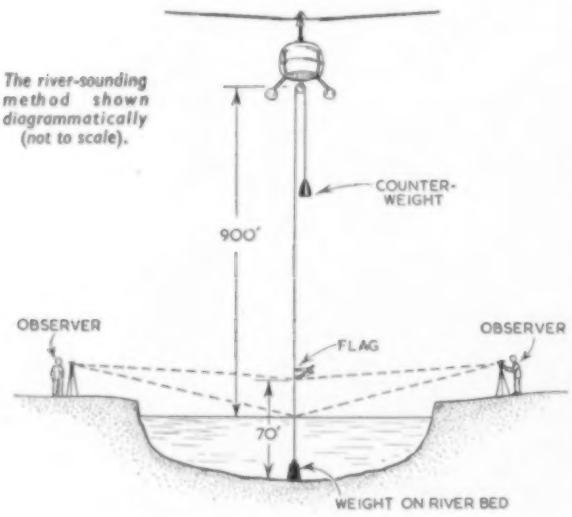
A final question was in regard to the merits and drawbacks of tip drive by ramjets. MR. FRISE said that, generally speaking, they had the one great merit of being the simplest and latest form of engine that could be put into a helicopter. In first cost and maintenance there was everything in its favour—for any kind of aircraft the ramjet was the simplest and latest thing; the only thing against it was its high fuel consumption. At the other end of the scale the compounded piston engine was the heaviest and had the lowest fuel consumption. If one wanted a "crane," which was not fast in forward speed, but which would lift a lot of weight as quickly as possible, tip ramjets were the answer; but if one wanted "to cruise around for half a day like the Navy," one had to consider the aeroplane to meet that requirement. Mr. Frise thought that all the known power units, down to the simplest ramjet, had their uses.

MR. SHAPIRO added that we had all now become accustomed to the fact that the jet was winning in fixed-wing transports. This was mainly for two reasons: that one bought better structural efficiency and thus got a higher payload for the same all-up weight, though with a higher fuel consumption; and that with fixed wings one got higher speed, and useful work done at a greater rate. With the helicopter the second feature did not apply, for one got no higher speed with jet propulsion. Helicopters were never going to show the superiority as a result of jet power which had now become apparent in fixed wings.

PLUMBING THE DEPTHS—BY HELICOPTER

AN interesting new technique has been evolved by Kenting Aviation, Ltd., the Hunting Group company of Oshawa, Canada, who employ aircraft for aerial survey and similar work. They have lately been using a Hiller 360 for obtaining depth-measurements of the turbulent Long Salt Rapids section of the St. Lawrence River—near Cornwall, Ontario—in connection with the St. Lawrence Seaway project.

The method is ingenious and, as will be seen from the diagram, fundamentally simple. The sounding-plummet is lowered from the helicopter by a specially designed winch which, the moment the bottom is touched, releases a counterweight that keeps the wire taut. Observers on each bank then take triangulation sights, using as references the surface of the water and a pennant attached to the wire 70ft above the plummet. From their readings at a number of points the contour of the river bed can then be plotted.



The river-sounding method shown diagrammatically (not to scale).

In practice, difficulties were experienced through the pressure of the swiftly flowing current on the wire—in places the river was 50ft deep—and by reason of the rocky bed, which sometimes trapped the plummet; but the experiment, the second of its kind, nevertheless proved successful.

RUSSIAN NIGHT FIGHTERS

A SWEDISH Defence Staff publication which appeared in Stockholm recently said that the Soviet Air Force lacks modern night fighters. "Russia has no special night fighters with built-in effective radar equipment in service," it added, and went on to remark that the Russians must certainly be working frantically to produce both night fighter aircraft and radar sites. "But their fighter defences against radar-equipped bombers are undoubtedly very weak," it concluded.

PILOTLESS BOMBERS OPERATIONAL

THE U.S.A.F. has announced that the 1st and 69th Pilotless Bomber Squadrons, formerly stationed at the Air Force Missile Testing Center, Cocoa, Florida, have been transferred from the Air Research and Development Command to the Tactical Air Command. Later this year they will be shipped to Germany as part of the NATO defences. The squadrons are equipped with Martin B-61A Matador surface-to-surface pilotless aircraft.

The Air Force Missile Testing Center, commanded by Maj. Gen. W. L. Richardson, was responsible for developing and training units in the use of the Matador.

The aeroplane

The Prestwick Pioneer C.C. Mk.I: the first aircraft both designed and built in Scotland to be accepted for service in the Royal Air Force. Noted for its exceptionally slow flying performance, the Pioneer is able to use any 100 yard strip with a full load aboard. Powered by an Alvis Leonides, 550 h.p.

The pilot

At 45, Wing Commander N. J. Capper has had a long career as a veteran of the skies. As R.A.F. Instructor, Airline Pilot, and Test Pilot, he has chalked up 7,000 flying hours since he first flew solo in 1929 with the R.A.F. Of the Shell and BP Aviation Service he says : " Wherever I go in Britain I find a ready and willing Shell and BP Aviation Service not very far away."

Shell and BP Aviation Service

On all major airfields in Britain, the pilots of any type of aircraft now take for granted the familiar sight of a Shell and BP refuelling truck. They know—and all manufacturers of aircraft know—that all their fuelling and lubrication requirements will be met with certainty and dispatch by the efficient operators of the Shell and BP Aviation Service.

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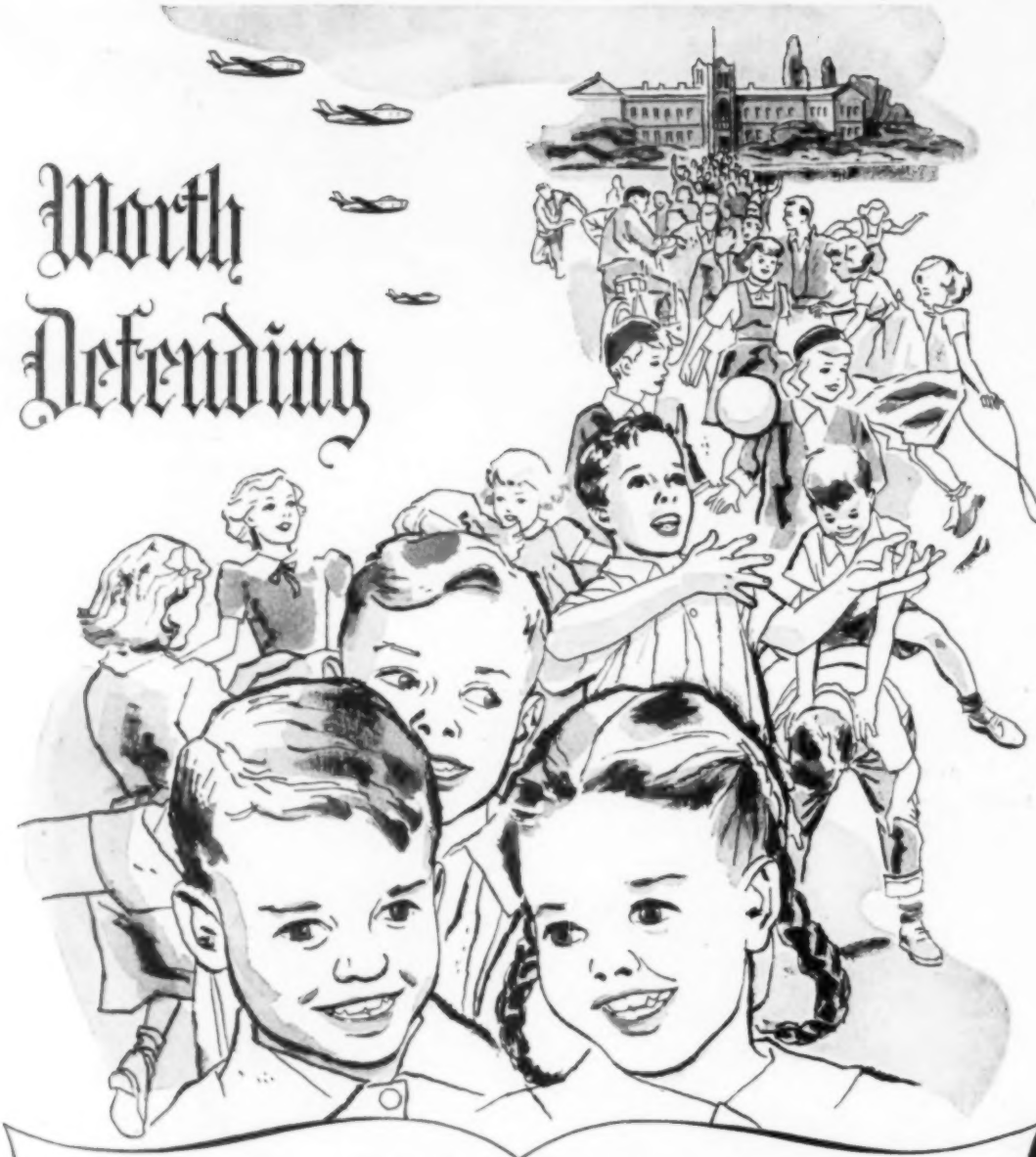

THE LIVES OF OUR CHILDREN . . .

. . . your children — our children — children of the nations of like minds to ourselves — happy, carefree children who look to us for their tomorrow.

What will that tomorrow be? What will *they* be tomorrow? Happy young people — happy useful citizens in a steady useful world — or the pitiful pawns of war, corruption and tyranny?

Their hopes can only be realized through our preparedness: the will and might to deter any who would harm our children, the determination that the freedom and peace our children deserve are *worth defending!*

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THE INDUSTRY

Dowty Directorship

IT is announced that Mr. M. C. Garrington has been appointed to the Board of Dowty Fuel Systems, Ltd., as production director. He served an apprenticeship with an engineering subsidiary of the Cadbury Organization before entering the aircraft industry at the age of 26. During the war he held positions as deputy chief inspector and chief planning engineer for the Vickers-Armstrongs group at Castle Bromwich and later at Chester. Immediately before joining the Dowty organization he was for two years works manager of Clarke Aircraft Products, Derby.

Mr. M. C. Garrington.

He joined Dowty Equipment, Ltd., in 1949 as fuel systems production engineer and last year was appointed superintendent of experimental manufacture. During 1953 he paid two visits to U.S.A. in connection with Dowty equipment being made there under licence.

Mr. Garrington is an Associate Member of the Institution of Production Engineers and an Associate of the Institution of Industrial Administration.

Rotax Appointments

MR. E. R. LEGG, technical sales director of Rotax, Ltd., has recently had the province of his work extended; the sales, export and servicing departments now come under his control, so that he is now director responsible for all sales activities of the company. He is assisted by Mr. Paul Griffiths, technical sales manager, and Mr. V. Meyer, sales manager.

These changes follow the recent resignation of Mr. C. D. E. Skinner from the Rotax organization.

Mr. E. R. Legg of Rotax, Ltd.

English Electric Promotion

ANNOUNCED recently was the appointment of Mr. Leonard H. Short, M.C., M.I.E.E., M.Inst.T., as general export manager of the English Electric Co., Ltd. He succeeds Mr. H. S. Aspinall, who retired on December 31st after having held the appointment since 1937. (Mr. Aspinall will remain a director of the English Electric Export and Trading Co.) Mr. Short served with distinction in the 1914-18 war. He held commissions in the Durham Light Infantry, the R.F.C. and R.A.F., and was awarded the Military Cross. After the war he joined English Electric at Preston as a pupil. Since then he has held a number of senior appointments with the company, including those of resident engineer in charge of railway electrification in India, and deputy manager and chief engineer of the traction department. From 1951 onwards he has been deputy general export manager. A director of the English Electric Export and Trading Co., Mr. Short has travelled extensively on his employers' business in most parts of the world.

Standards for Packaging

A NEW section on the employment of desiccants completes that part of the B.S.I.'s Packaging Code (B.S. 1133) which deals with deterioration of consignments during storage or transportation. The three relevant sections (obtainable, at the net prices shown, from the B.S.I. sales branch at 2 Park Street, London, W.1) are Sec. 5, *Protection against Micro-organisms, Insects, Mites and Rodents* (2s); Sec. 6, *Temporary Prevention of Corrosion of Metal Surfaces* (10s 6d); Sec. 19, *Use of Desiccants in Packaging* (3s).

A Film about Forging

ENTITLED *They've Come a Long Way*, an informative film has been sponsored by Garringtons, Ltd. (members of the G.K.N. group), whose forgings plant at Bromsgrove, Worcs, is one of the largest in Europe. After tracing the history of the firm from its foundation in 1837 by a blacksmith named John Garrington, the film goes on to deal with the very different techniques practised today.

Although the theme of the modern sequences is the forging of a car-engine connecting-rod, aeronautical technical societies and similar organizations will find, in the processes illustrated, plenty to interest their members. The film will shortly be available, in 16 and 35 mm sizes, on loan for such purposes.

Garringtons, incidentally, are now in large-scale production of blades for the leading gas-turbine manufacturers, using the upsetting process; we hope to make further reference to this work in a future issue.

IN BRIEF

Mr. W. M. Widgery, F.R.Ae.S., has resigned from the Board of Normalair, Ltd., Yeovil. Dr. E. W. Still, Ph.D., B.Sc., A.C.G.I., A.M.Mech.E., F.R.Ae.S, will succeed him as technical director. Previously, Dr. Still was research and development manager of Teddington Controls, Ltd., and before that chief project engineer with Rolls-Royce, Ltd.

* * *

Major J. Vivian Holman, A.F.R.Ae.S., M.I.Ae.S., has been appointed aviation consultant to William Sugg and Co., Ltd., of Westminster. The company's engineering activities are now being extended by the erection of a factory at Crawley, catering largely for the requirements of the aircraft industry.

* * *

Among impending staff changes in the United Steel Companies, Ltd., is the appointment of Mr. H. P. Forder, assistant general manager (commercial and administration) of Samuel Fox and Co., Ltd., to the post of deputy general manager. Mr. R. J. Bavister is promoted to commercial manager.

* * *

The appointment is announced of Mr. J. E. Sunderland, A.C.A., as director and general manager of Enfield Cables, Ltd. He joined Enfield Cables in 1946 and has been a member of the Board since 1951. Also announced is the appointment of Mr. D. J. Smith, O.B.E., B.Sc.(Eng.), D.F.H.(Hons.), A.M.I.E.E., as technical director. During the war he was flying with the R.A.F.V.R.; then, following an air accident, he was posted to Bomber Command as Chief Electrical Engineer. Since the war he has been with the Copper Development Association and, latterly, the British Electricity Authority.

* * *

Like all other aircraft of the type, the Shackleton illustrated in our issue of January 29th was equipped with de Havilland contra-rotating airscrews, and not another make as stated.

* * *

Well known for his contributions to rubber technology, Dr. C. M. Blow, Ph.D., F.R.I.C., has joined Precision Rubbers, Ltd. (of Bagworth, Leicestershire) as technical director.

* * *

More than £200 was awarded to employees of Kelvin and Hughes, Ltd., for productivity suggestions at their Barkingside, Essex, factory during 1953. Output from the company's three factories has increased by 70 per cent in the past two years.

* * *

Elliott Brothers (London), Ltd., manufacturers of electrical, electronic and process-control instruments, announce the transfer of their Manchester branch office to 66 Deansgate, Manchester 3 (Blackfriars 7752). The Fisher Governor Co., Ltd., who make automatic control equipment as associates of Elliott Brothers, will also cover the Manchester area from this address.

CLUB AND GLIDING NEWS

INCREASED flying time and a decreased accident-rate were reported at the 25th annual convention of the Royal Canadian Flying Clubs Association, which opened in Ottawa on January 25th. For the twelve months ended November 30th, 1953, the total flying time logged in club aircraft was 66,336 hours, an increase of 14 per cent over the previous year. Fatal accidents numbered six, compared with 15, and the total number of accidents was reduced almost 40 per cent to 40, 38 of which were attributed to "pilot error."

Membership of the association consists of 7,700 pilots, who belong to 37 clubs. Twenty of these clubs provide summer training for reserve officers of the R.C.A.F., and this scheme has proved a most useful source of income to the organizations concerned. The most active club during the year was that at Edmonton, with a total of 6,543 flying hours.

On the opening day of the convention, safe-flying awards were presented to 21 clubs which had achieved an accident-free record during the year. A speaker at the Silver Jubilee dinner the following evening was Sir William P. Hildred, director-general of I.A.T.A., who stated that co-operation between the Government and the flying clubs had resulted in 1,000 private pilots' licences and 150 commercial licences during the past 12 months.

TYPICAL of the wide choice of modern light aircraft available in the U.S.A. are the two 1954 Beechcraft models shown in the photographs below. They are the model E35 Bonanza, which seats four, and the six-seater B50 Twin-Bonanza. The standard version of the new Bonanza retains the 205 h.p. E-185-11 Continental engine that has powered previous models, while the more powerful E-225-8 Continental (225 h.p.) is available as an alternative installation. The latter gives the Bonanza a cruising speed of 184 m.p.h. at 65 per cent power at 8,000ft, compared with 175 m.p.h. with the lower-powered engine. The rate of climb, it is claimed, is increased by 200ft/min, and 1,000ft is added to the full-load ceiling. A new feature of both versions of the new Bonanza is an aileron-trim control, fitted on the end of the control column. The customary American improvements in comfort and appearance are also incorporated in the new models.

After experience with the few "hand-made" civil Twin-Bonanzas and the production orders for military versions of the type for the U.S. Army, the Beech company has now put the civil B50 model of the Twin-Bonanza into full production. Powered by two Lycoming GO-435-C2 engines, this type has a gross weight of 6,000 lb (with full tanks and six passengers, this permits 191 lb of baggage to be carried); typical performance figures at full gross weight are: cruising speed, 192 m.p.h. at 10,000ft, rate of climb, 1,450ft/min, and service ceiling 20,000ft.

A significant feature on both Beech machines is the provision of complete safety harnesses (including shoulder straps) for each occupant. Harnesses and attachment fittings are stated to be capable of withstanding a force of 25g. A recent recommendation by the Cornell Committee for Transportation Safety has urged the installation of such equipment on "non-transport type" aircraft.

ONLY nine days were suitable for flying at the Yorkshire Aeroplane Club during December, due to bad weather on the other 22. The 27 hours flown during those nine days pushed the total for 1953 up to 1,400. Bad weather continued during January, when the flying time totalled 63 hours. In aid of the club's international rally fund, a dinner and dance is to be held in Leeds next Friday, February 19th. Further trials of the new Slingsby Skylark sailplane have recently been performed at Sherburn, the club's base.

NIGHT flying at Elstree is proving very popular. On Thursdays each week, the night-flying programme is held in conjunction with a club night, when members not flying come out to eat, drink, chat about and watch the activities of their colleagues. January's overall target was exceeded with a total of 137 flying hours, in spite of bad weather conditions, and the month's flying time compares well with the January 1953 total of 78 hours.

LONDONDERRY HOUSE, once again, has been selected for the 1954 ball organized by the British Gliding Association, which is to take place from 7 p.m. until midnight on Saturday, March 13th. Tickets, price £1, may be obtained either from member-clubs or from the secretary of the B.G.A. (at Londonderry House, 19 Park Lane, London, W.1). One of the objects of this year's ball is to raise money for the organization of the World Championships in Derbyshire this summer, and for the equipment of the British team for the contests. Following last year's precedent, the annual general meeting of the association will be held in the afternoon of the same day as the ball, and the Instructors' Conference on the following day.

AT Lasham, a merger has taken place between the Army Gliding Club and the Surrey Gliding Club, which have previously been operating separately from the same airfield. A target of 15,000 launches has been set for the twelve months beginning February 1st, when the partnership came into effect. Other clubs operating from Lasham are the Imperial College Gliding Club (which has been in partnership with the Surrey club for the past seven years), the Polish Gliding Association in Great Britain, and the recently formed clubs belonging to the Crown Agents Department and the Iraq Petroleum Company (both of which use the Surrey club's facilities also). A Tiger Moth, presented to the Surrey club by Malcolm Laurie, began aero-towing work on January 17th; one economical way of obtaining an aero-tow is by winning the recently introduced sixpenny raffle, held each Saturday evening.

In view of the decision to standardize training on T.21B machines, the T.31 Tandem Tutor belonging to the Surrey club is to be sold in the near future. Dates confirmed for training courses at Lasham during the year are: March 22nd-April 9th, April 26th-May 3rd, May 17th-29th, June 14th-26th, July 5th-17th, August 9th-21st, August 30th-September 11th, September 20th-October 2nd. Further details concerning these courses can be obtained from the club at Lasham Airfield, near Alton, Hants.

THIS year's courses at Dunstable, also, have been announced by the London Gliding Club. The dates are April 20th-30th, May 15th-22nd, June 14th-25th, July 19th-30th, August 9th-20th, August 30th-September 11th, and September 25th-October 2nd. In charge of the courses will be John Free, previously with the Army club, who has replaced George Scarborough as full-time flying instructor at Dunstable. Enquiries for the courses should be addressed to the club at Dunstable Downs, Dunstable, Bedfordshire.

THE new club-house of the Midland Gliding Club, which stands 1,500ft above sea level on top of the Long Mynd escarpment, is now almost completed. It contains a dining-room and a lounge, forming an extension to the hangar, and has been built to cater for the increasing club membership, which totals over 150 at present. The improved accommodation will also enable the club to hold large-scale competitions, which have previously been difficult to arrange. A second hangar has been completed and turned into an aircraft and transport repair shop.

BEECHWEAR: These two 1954 models are the Beechcraft E35 Bonanza, now available with a more powerful Continental engine, and the B50 Twin Bonanza, a six-seater machine which has just been put into quantity production. Both types are described above.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication must in all cases accompany letters.

Airmail Stamps

I SHOULD like to congratulate *Flight* upon the very interesting and well illustrated feature in the January 29th issue—*Stamps Old and New*, on page 131.

From time to time one notices that there is quite considerable interest taken in the well-produced stamps showing aircraft and reproduced in your pages; but this is, to my knowledge, the finest effort yet.

I am a collector of air stamps of a particular type—only those which bear the image of an authentic aircraft; the scope is thus rather narrow, and is, of course, dependent upon issues by countries outside the British Isles. This is a point of much regret when one considers, for instance, what a thing of beauty a special large-format "Farnborough" issue could be!

However, stamps are intended for a certain use; and who are we to challenge our own G.P.O.?

Hitchin, Herts. E. B. WILLIAMS.
Hon. Gen. Sec., North Herts Stamp Club.

Ejector Seats

THE news (reported in "Aircraft Intelligence," page 67, *Flight*, January 15th, 1954) that the Venom NF.3 and Sea Venom F(AW)20 will not be fitted with ejector seats is profoundly disturbing. No complementary announcement is made of any alternative, and equally efficient, means of emergency escape.

Climbing from any aircraft flying faster than about 300 m.p.h. is very difficult; inverting, opening cockpit, releasing straps and dropping out is the best method; but, with a crippled and/or blazing aircraft, often impossible.

The tiny Saab Draken has an ejector seat for which Follands hold the licence, and North American spent a year developing one to fit the F-86 Sabre; if de Havilland cannot design an airframe to take existing seats, smaller types should be produced.

In World War I pilots had no parachutes. Today this device is a very great safety factor, yet of little value if bale-out is possible only in favourable conditions; aircrew accept risks, even in peacetime, but this situation could, if war came, bring serious losses.

Cambridge. PEDANTICA.

[The Venom FB.1 single-seater has an ejector seat.—Ed.]

Museum of Models

I HAVE read with interest the articles and correspondence which have appeared in recent issues of *Flight* concerning the preservation of historic aircraft and the establishment of a national museum of aircraft.

The ideas put forward by your several correspondents seem to range between the preservation of a comparatively small number of historic aircraft which are still in existence to the formation of a much larger collection of representative types to illustrate the progress of British design and construction from the earliest days up to the present time. Whilst the former seems to be a reasonably practical proposition, especially since the recent action of the Royal Aeronautical Society ensuring the retention in this country of a number of aircraft which could form the nucleus of such a group, the latter idea appears to be hedged about with numerous difficulties, not the least of which is the problem of housing and presentation, and the all-important factor of cost.

To my mind, the value of any such collection of aircraft would lie in its completeness; and, because of this, the preservation of a mere handful of historic types, whilst undoubtedly being of extreme value, does not seem to go nearly far enough to satisfy the concept of a national museum. This leads one to examine the more ambitious scheme which has been put forward, that of enlarging the collection to include representative examples of British aircraft produced "through the ages." But here we come face to face with a number of difficulties.

Firstly, the problem of housing the exhibits. As has already been pointed out by your correspondents, suitable accommodation for anything resembling a complete representative collection would require an enormous amount of space and such accommodation would, of necessity, have to be under cover. Secondly, there is the problem of the availability of types of aircraft which should find a place in the collection. A number of aircraft of the First World War are still in existence, as are a number which became famous in the recent war; but where should we find a Vimy, an 0/400, a Gamecock, a Bulldog, a Virginia or a Heyford, to name only a few which shou'd qualify for inclusion? And on the civil side we should be hard put to unearth an example of a W.8, a Hercules or an H.P.42, for these more pacific types should find a place no less than their militant contemporaries. Mention has been made of using reconstructions of types not otherwise obtainable, but I feel that even if such wholesale reconstruction were possible from a financial point of view, the lack of authenticity would detract to a great extent from the value of the exhibits.

Above all, there is the bugbear of finance, and here it seems that the cost of such a collection, including housing, maintenance and the production of reconstructed types would be so great that it could not possibly be met by either private or official bodies.

Must we, then, give up the idea of a national museum altogether? I think not. It seems that a practical solution lies in the suggestion put forward in your leading article in the issue of January 22, that models should be brought into use. This idea has much to commend it and it interests me particularly in that it follows closely the very modest efforts which I have been making as a hobby over the past 20 years or so to build up a collection of models of representative types illustrating the progress of British aircraft work from the beginning of aircraft construction in this country up to the present day. (You may remember publishing a photograph of part of my collection in your issue of October 10th, 1952.)

If a national museum were formed around a collection of models it would be important that the scale should be such that really detailed examples could be built; and it would be equally important, as your editorial points out, that all the models should be made to the same scale. The models in the Science Museum and elsewhere, excellent though they are as individual pieces of workmanship, do lose much of their interest as a collection by reason of the many different scales employed.

With a combination of the few actual aircraft already available and a series of detailed scale models of other important types the problem of housing the exhibits and their presentation would be a comparatively minor one. Very little maintenance would be needed and, above all, the cost of the project would come well within the bounds of possibility. It may be, too, that the various aircraft manufacturers, the Society of British Aircraft Constructors, Government and other bodies, might be much more willing to come forward with assistance in one way or another.

Weymouth, Dorset. W. O. DOYLEND.

Ludicrous Theory

FOR the completion of the ridicule attaching to the statement (quoted in *Flight* of January 29th, p. 136) made by an American "aviation correspondent" relative to the Comet's exceeding its critical Mach number, may I point out that on the day of the mishap the wind was in fact westerly, and would therefore have been a head-wind to that particular aircraft?

Maidstone, Kent. J. B. PLUNKETT,
Air Charter, Ltd.

FORTHCOMING EVENTS

Feb. 12. A.T.A. Association: Annual reunion dinner.
Feb. 13. British Interplanetary Society (Midlands Branch): "Astronautical Physics," by N. H. Langton, Ph.D.
Feb. 13. British Interplanetary Society (Provisional Yorkshire Branch): "Some Experimental Work on Rockets," by D. N. Hunter.
Feb. 15. Photogrammetric Society: "New Plotting Machine for Air Photographs," by J. E. Odle.
Feb. 18. R.Ae.S. Section Lecture: "Helicopter Research," by F. J. O'Hara, A.R.Ae.S. (jointly with the Helicopter Association).
Feb. 20. British Interplanetary Society (North-west Branch): "Building the Lunar Base," by R. A. Smith.
Feb. 23. R.Ae.C.: Film Show.
Feb. 24. R.Ae.C.: Dinner to speed and height record holders.
Feb. 24. R.Ae.S. Graduates' and Students' Section: "Aircraft Plastics," by Lorne Welch.
Feb. 25. Aerodrome Owners' Association: Annual general meeting and dinner.
Feb. 26. Institute of Transport: Annual dinner.
Feb. 26. Northern Heights Model Flying Club: Annual dinner and dance.
Feb. 27. British Interplanetary Society (Provisional Western Branch): "Provisioning of Interplanetary Vehicles," by G. L. Garthwaite.

R.Ae.S. Branch Fixtures (to Feb. 28).—Feb. 15, *Halton*, junior members' night. Feb. 16, *Belfast*, "Short Analogue Computer," by E. Lloyd-Thomas. Feb. 17, *Coventry*, "Development of Bristol Proteus Engine," by Dr. S. G. Hooker; *Manchester*, "Rocket Power Plant," by S. Allen.

Feb. 18, *Leicester*, "Present Trends in Aircraft Materials and Construction," by W. A. Baker.

Feb. 23, *Belfast*, "Engineering Aspects of the Flutter Problem," by N. P. Shevloff. Feb. 24, *Weybridge*, "Shape of Wings to Come," by D. Keith-Lucas. Feb. 25, *I.O.W.*, "Accident Investigation," by A. Cdre. Sir Vernon Brown. Feb. 26, *Birmingham*, "Development of the Vickers Viscount," by A. Greenwood.

CIVIL AVIATION

STOCKHOLM-MOSCOW TRAFFIC INCREASE

THE arrangement between S.A.S. and Aeroflot concerning flights from Stockholm *via* Helsinki to Moscow and other Russian cities was reported in *Flight* of December 11th. It has now been announced that the frequency of flights between the Swedish and Russian capitals is to be increased from three to six per week, and that a reduction in the time spent at Helsinki will reduce the total journey time by 25 minutes. As hitherto, S.A.S. will serve the Stockholm-Helsinki sector, and Aeroflot the route Helsinki-Leningrad-Moscow.

Director Winberg, of the Swedish Board of Civil Aviation, and Per Norlin, president of S.A.S., have reported, in connection with the agreement, that they were given the opportunity to study a number of Russian airfields, and that these appeared to be well equipped. Extensive reconstruction and building work was in progress, many new airfields were being built and the air traffic control services appeared very efficient.

THE USE OF VALLEY

THE question of the possible increased use of Valley airfield, Anglesey, for Transatlantic air services was raised in the House of Commons by Mr. Cledwyn Hughes on January 27th. Referring to the general increase in air traffic, Mr. Hughes suggested that by modifying the present concentration on two or three large airports (mainly associated with big cities) and by using a number of airports on the west coast, a smoother traffic flow would be possible.

In the case of Transatlantic services, he continued, Prestwick met part of the need, but its facilities and weather record were not as good as those of Valley. Mr. Hughes mentioned as an example of the traffic which could be handled the movement of 2,600 aircraft and 40,000 personnel to the United States from Valley, which took place in May 1945.

Replying, Mr. George Ward, Under-Secretary of State for Air, said that the good facilities and weather record of Valley were well appreciated by the R.A.F., who used it as an advanced flying training school. The present position was that in addition to its R.A.F. functions, Valley was designated as an alternate airfield for Transatlantic civil aircraft. It was also what the R.A.F. termed a master airfield, which meant that it was open to all aircraft in emergencies. Little use had actually been made of the airfield as an alternate, however, by the main Transatlantic operators.

It seemed that present facilities at civil airports combined with those offered by Valley were adequate for existing requirements. If further civil requirements arose they would be considered in conjunction with Valley's R.A.F. commitments.

K.L.M. PIONEER RETIRES

AFTER completing 42 years in aviation (32 years with K.L.M.), Mr. George Young, chief technical officer of the Dutch airline's U.K. and Ireland region, retired last month. Born in 1888, Mr. Young was employed on aircraft-engine projects at the Luton factory of Vauxhall motors in 1912, prior to his service in the R.F.C. and R.A.F. His association with air transport began in 1919, when he joined the British company Air Transport and Travel, some of whose aircraft were chartered by K.L.M. at that time for their Amsterdam-London services.

In 1921 he joined the Dutch company, and subsequently occupied a number of ground engineering positions. Between the two world wars, as chief ground engineer of the U.K. and Ireland region of K.L.M., he played a large part in developing the company's services. During the war the services included those from Shoreham and Lympne to Amsterdam and, later, from Bristol to Lisbon. For work on this latter service he was awarded membership of the Order of the British Empire, and in 1950 received the gold medal of the Dutch Order of the Oranje Nassau.

He was unable to play a major part in the K.L.M. entry for London-Christchurch Air Race last October, but acted in an advisory capacity while the Dutch DC-6 was based at London prior to the race.

HANDSHAKE from Col. R. Madeley, flying superintendent of South African Airways, for Capt. A. M. A. Majendie of B.O.A.C. The scene is the arrival of the Comet 2 from Khartoum after a 460-m.p.h. non-stop flight. Looking on are D.H. test-pilots Peter Bugge and John Cunningham (right).

STARWAYS TOURS APPROVED

TWO applications by Starways, Ltd., to operate inclusive-tour services have recently been approved by the Minister of Transport and Civil Aviation. Approval until October 30th, 1955, is given for a seasonal (June-October) inclusive tour between Renfrew and Tarbes (for Lourdes) with technical stops at Jersey or Hurn; the other tour, approved till October 31st, 1954, is between Speke and Nice, with a technical stop at Hurn. An application by the same company to terminate its Speke - San Sebastian tour at Biarritz instead of Bilbao during 1954 has also been approved. The company operates DC-3s.

B.E.A.'s GLASGOW TERMINAL

FOLLOWING negotiations with the Hotels Executive for premises in St. Enoch Square, Glasgow, B.E.A. opened their new air terminal there on Monday last, February 8th. The initial steps for this move were made some six years ago, when the corporation's Scottish manager, Mr. R. McKean, first took over his present duties. In 1948 the existing premises in St. Enoch railway station were already scarcely big enough to cope with the steadily growing volume of traffic, and the situation rapidly became critical. Architects for the new terminal were Sam Bunton and Associates, and a contemporary style of decoration was adopted. The terminal has particularly efficient heating, ventilation and lighting systems.

SUPER CONNIES FOR QANTAS

WITH delivery of their first Lockheed 1049C Super Constellation due on April 9th, Qantas Empire Airways are well ahead with plans for introducing four of these aircraft on their long-range services during 1954. It is expected that delivery of this initial batch will be completed early in July, and that the three remaining Super Connies will join the fleet about a year later.

Nearly fifty flight crew and ground staff are now being dispatched to Burbank, California, for specialist courses on the new airliner. In charge of the training, acceptance and delivery programme is Mr. Don Armstrong.

Meanwhile, six of the Australian airline's Constellation 749As are being converted to tourist standard in preparation for the introduction of cut-fare services in the Pacific area later this year (at rates some 20 per cent below the existing tariff).

Seating capacity of the aircraft is being increased from 39 to 60. Qantas have developed special chairs similar to those installed in the high-density version of the Super Constellation, and these are being manufactured in Sydney.

Some further structural alterations are involved. Floors are being strengthened to withstand the high loading imposed by the additional seating capacity, and one additional emergency exit is being provided in each aircraft to meet the requirements of the Australian Department of Civil Aviation. One extra cabin window is also required. All the associated design and development work, including stressing, was undertaken by the technical services division of Q.E.A.'s engineering department.

The Constellation has been in service with Qantas since 1947 and was first introduced on the Kangaroo route between Sydney and London in December of that year. The type is still used almost exclusively on this route, with the exception of the fortnightly Indian Ocean service between Sydney and Johannesburg. Utilization is at the high average daily rate of just over 8 hr.

Good homes for Horses . . .

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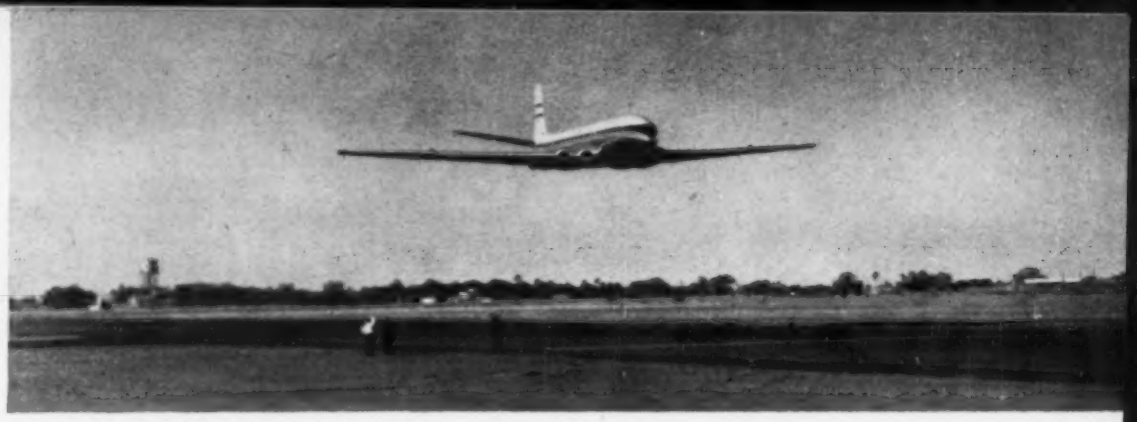
CIVIL AVIATION...



RECORD-BREAKER: The return of the Comet 2 which made the London-Khartoum record flight is referred to below. Here, John Cunningham brings it over the line at Khartoum.

COMET 2 RETURNS

THE first production Comet 2, G-AMXA, returned to Hatfield on Saturday afternoon after flying from Entebbe in 10 hr 55 min, including a 1¼-hour stop at Cairo. Its crew, headed by John Cunningham, were welcomed back by Sir Geoffrey and Lady de Havilland, and by two of Sir Geoffrey's directors, Mr. R. E. Bishop, chief designer, and Mr. C. L. Thom, business manager. Mr. Cunningham expressed himself well satisfied with the aircraft's performance, and said that all design predictions had been confirmed. Take-off and landing tests, totalling about 8 hr, were made at Khartoum and Johannesburg (full-weight take-offs being made at 32 deg C and 27 deg C respectively), and there were also demonstration visits to Durban and Langebaanweg, the military airfield near Cape Town. Over the whole 14,000-mile round trip there was no mechanical trouble.

RESUMPTION OF COMET SERVICES

IN a statement distributed among employees on February 4th and subsequently issued to the Press, B.O.A.C. said that after the incorporation of nearly fifty modifications in each aircraft of the Comet 1 fleet, formal application will be made to the Ministry of Transport and Civil Aviation for the re-introduction of Comets to passenger-carrying service. It is expected that this work will be completed by the end of February and that the South African services will be resumed first. Many of the modifications had been decided upon before the accident to G-ALYP on January 10th and had been incorporated in the design of the Series 2 and Series 3.

The fleet was withdrawn from service on the day after the accident, to permit a "minute and unhurried technical investigation" of each Comet to be made at London Airport. Some aircraft were specifically inspected for structural weakness, others for shortcomings in the components and others for "functional lack" in the electric, hydraulic and control systems. These localized inspections were, of course, complementary to detailed study of the general condition of each machine.

In addition, experts of de Havilland, B.O.A.C. and the A.R.B. were asked to consider every possible cause of the accident, taking into account the possibility of a combination of seemingly trivial failures—individually harmless but serious if occurring simultaneously or in sequence. However, B.O.A.C. state that nothing was found that could remotely be accepted as a *prima facie* cause.

The B.O.A.C. statement added that the under-water search for parts of G-ALYP had not yet yielded anything of notable importance, but that it was most desirable that the search should continue. [At the time of writing the official search had located no major portions of the aircraft, but on Sunday last an Italian vessel picked up a 9ft piece of starboard wing upper surface.]

No direct medical evidence was forthcoming, said the B.O.A.C. statement, and it appeared that early theories conflicted so much as to be valueless. Some of the first parts to be salvaged gave a slight clue in the form of signs of unusual heat near a fuel tank. Sir Miles Thomas has expressed his belief that "it is very much better . . . to be over-cautious in the matter of Comet operation from now on than to adopt any attitude that does not include the most stringent and even imaginative safety precautions." Some of the modifications which are being made to the Comet 1s as part of this "extra-precautionary" policy are described as follows:

". . the fitting of armour-plate shields between the zone of the turbine blades and the fuel tanks. Although there is no recorded case of a Ghost engine suffering rotor failure, it is known that if a projectile is fired into a tank half full of kerosine, and it penetrates with violence above the fuel level, an explosion can occur. Even although this is extremely unlikely, precaution is being taken against it.

"Similarly, a modification is being introduced to enable the electric battery to be vented to the outside atmosphere so that in the event of it becoming seriously overcharged and starting to 'gas' there can be no possible accumulation of even the very small quantity of hydrogen that would be given off.

"Extra fire-warning detectors are being fitted to zone three of the engine cells. To guard against the possibility of fuel accumulating in zone two in the event of a pressure fuel hose failing, special metal braided reinforced pipes are being introduced and the inspection period is being made still more frequent.

"Other modifications include improving engine breathers; extra temperature gauge in equipment bay: ducted air to electric motors: removing hydraulic drains at Frame 10; fitting Cutler Hammer relay for battery change-over; improved ventilation of rear-fuselage under-floor zones; extra smoke detector in rear fuselage; reducing fin spark-gap; removing rudder trailing-edge strip; providing drain holes in rear spar centre-section inspection door; repositioning fire detector in zone 3; reinforcing wiring to A.D.F. sense aerial amplifier in aileron booster bay; extra lightning conductor on fin; and larger clips on booster pump conduits."

The Corporation estimated that the cost of withdrawing the Comets is about £75,000 per week, which will probably result in a total loss of over £500,000, excluding modifications, by the time they are in service again.

It was reported from Paris last week that the five series 1A Comets operated by Air France and U.A.T. would also resume flying soon, after modifications similar to those of B.O.A.C. have been carried out. The first Air France Comet for modification arrived at Hatfield on Monday last, February 8th.

FULL C. OF A. FOR THE TUDOR

FOLLOWING a number of A.R.B.-approved modifications, the Avro Tudor was granted a full Certificate of Airworthiness by the M.T.C.A. on February 2nd. Previously the type C. of A. was valid, *inter alia*, for the public transport of mail and freight, but not of passengers. The company responsible for the re-introduction of the Tudor into passenger service is Air Charter, Ltd., of Stansted, and the actual modifications were carried out by Air Charter's associated company, Aviation Traders, Ltd. The first passenger flight was to have been made between Stansted and Hamburg by a Tudor 1, G-AGRG, on Sunday last, but was postponed due to ice on the Stansted runways.

After the purchase of four Mk 1 machines, two Mk 3s and four Mk 6s by Aviation Traders in September 1953, the company ascertained the modifications required by the A.R.B. for the Tudor's full certification in the public transport category, and proceeded to carry them out on G-AGRI. This aircraft was tested by the A.R.B. and was found to have a performance markedly better than in the M.o.S. tests of 1946 (performed on the same machine). The improved performance has made it possible to operate the type in accordance with the 1951 airworthiness requirements (instead of the less stringent pre-1947 requirements which normally would apply), with little restriction on operation.

The main modifications embodied in the Tudor by Aviation Traders, Ltd., include removal of the pressurizing equipment, the introduction of new cabin heating and ventilation systems, re-routing of electrical cables and re-positioning of electrical and radio equipment, incorporation of an additional emergency exit, fitting of later-type wheels and airscrews, and addition of passenger amenities. The Aviation Traders group has at present a total of 20 Tudor aircraft, ten of which are being converted for passenger operation by Air Charter, Ltd. The operating company has applied for permission to operate normal scheduled and "Colonial Coach" services between Stansted and Lagos, and if this is granted will use the Tudors on these services. The machines, which will each carry 42 passengers, will be used also on charter work and possible trooping contracts.

NEW U.S. HELICOPTER SERVICE

THE first scheduled passenger helicopter service in the United States, excluding the New York inter-airport service, went into operation on Monday, when National Airlines began services between Miami, Florida, and West Palm Beach.

The eight-passenger Sikorsky S-55s used on the service make the 75-mile trip, which includes eight stops, in 77 min.

It is also reported from the U.S.A. that National Airlines have been granted an option on the first delivery of Sikorsky's 35-passenger S-56 twin-engined helicopter. Los Angeles Airways and Sabena are also reportedly negotiating for the S-56.

B.A.L.P.A. REQUEST REOPENING OF INQUIRY

FOLLOWING "new information on the operational techniques of the Comet," the British Air Line Pilots' Association have asked the Minister of Transport and Civil Aviation, Mr. Lennox-Boyd, to re-open the inquiry into the Comet accident at Ciampino Airport, Rome, in October 1952. The Association have asked that the decision of the previous inquiry (that the accident was due to an error of judgment by the captain of the aircraft) be reconsidered in the interests of the pilot.

THOROUGHBREDS: PH-TGA, winner of the New Zealand Race transport handicap, is one of the two new DC-6As used by K.L.M. on regular trans-atlantic freight services. It is seen at London Airport taking aboard racehorses for America.

CIVIL AVIATION . . .

TRANSATLANTIC CARGO

REPLYING to a question by Mr. Frank Beswick in the House of Commons last week, the Minister of Transport and Civil Aviation, Mr. A. T. Lennox-Boyd, said that B.O.A.C. had not applied to operate all-freight services across the North Atlantic, and that so far as he knew, the Corporation had no such service in mind. Mr. Beswick then asked whether it was in accordance with Government policy for one private company to be put into a specially protected position on this route. The Minister replied that once a company had been chosen to operate a route, all applicants had to satisfy the Air Transport Advisory Council that their service would not undermine the existing one.

The private company concerned is Airwork, Ltd., who received Mr. Lennox-Boyd's approval one year ago to operate all-freight services between London and Montreal and New York for a period of ten years. Subsequently Airwork applied to the C.A.B. for a "foreign-carrier permit" to operate these services, and their application now awaits the final approval of President Eisenhower.

Airwork's original application for British Government approval was made at a time when the Corporations had undertaken not to ask for an extension of their existing freight networks for a period of twelve months. This period expired on July 15th, 1953. Mr. Beswick's question was clearly inspired by the fact that B.O.A.C. has not in fact applied to operate transatlantic freight services despite earlier official statements to that effect.

For example, B.O.A.C. said in February 1953 that freight and passenger services were regarded as complementary, and that "the economy of passenger services would be severely affected by any diminution of the Corporation's ability to attract freight." The statement also said that B.O.A.C. intended to make application for formal licence [to operate Atlantic all-freight services], and that the M.C.A. had been notified of this intention.

Again, Sir Miles Thomas, B.O.A.C. chairman, told the Select Committee on Estimates on April 22nd last year that ". . . we have not yet got clearance on all the special freight routes we would like to develop. But we are putting in an energetically processed application for a transatlantic freight route to North America and, dependent on that, we intend to order five specialized Britannia freighters . . ."

B.O.A.C.'s latest annual report, published on September 22nd, noted that "no new freight services have as yet been introduced by these [independent] companies over the routes covered by the Corporation's network . . . in order to provide for the future expansion of this type of traffic, the Corporation has constantly under consideration the desirability of operating all-freight services on suitable routes, particularly on the North Atlantic."

It now appears that the Corporation has been dissuaded from applying for a North Atlantic freight licence. As things stand, Airwork, rather than B.O.A.C., seems likely to be No. 1 customer for the Britannia freighter. This promises to become by far the best aircraft for the route, but since it will not be available for about three years the problem of interim equipment remains.

Airwork's application to the C.A.B. envisaged an initial, unprofitable service with Hermes, to be replaced as soon as possible by DC-6As, which would make money. Assuming that Treasury approval for purchase of DC-6As was forthcoming, these would presumably be used until Britannias became available and would then be sold or relegated to other routes.

We have been forced to surmise because neither B.O.A.C. nor Airwork seems at present disposed to discuss the Government's policy or their own plans. The situation here *vis-à-vis* Atlantic freight contrasts sharply with the corresponding situation in America, where all relevant discussions between operators and the C.A.B. are published in full. Oddly enough, the subsidized American-flag carriers have so far been protected against competition from independent companies anxious to break into the Atlantic freight market, whereas Britain's State airline is now being restrained from doing so to encourage private enterprise.

Both P.A.W.A. and T.W.A. are licensed to run all-freight services between America and Europe. Applications to do so have been filed with the C.A.B. by six non-subsidized U.S. companies —European American, Flying Tigers, Overseas National, Seaboard and Western, Trans Caribbean and Trans Ocean. These applications were opposed by P.A.W.A. and T.W.A., and to a lesser extent by United Air Lines, and supported in principle by the Defense Department and by various port authorities.

On January 6th it was announced that Mr. H. K. Bryan, C.A.B. examiner, had recommended the issue of a five-year licence to Seaboard and Western Airlines. This decision has yet to receive the endorsement of the C.A.B. itself and of President Eisenhower.

Seaboard regularly operate charter services across the Atlantic with DC-4s, and have ordered four L.1049B Super Constellations for delivery this autumn. Of these, two will initially be leased to Aerlinte for passenger services and—subject to U.S. Government approval—two will open a scheduled "pipeline" service carrying freight between America's eastern seaboard and Luxembourg. It is intended to operate feeder services with DC-4s at both ends of the "pipeline." When all four Super Constellations are operating the transatlantic freight run Seaboard envisage an annual total uplift of 8,000 tons.

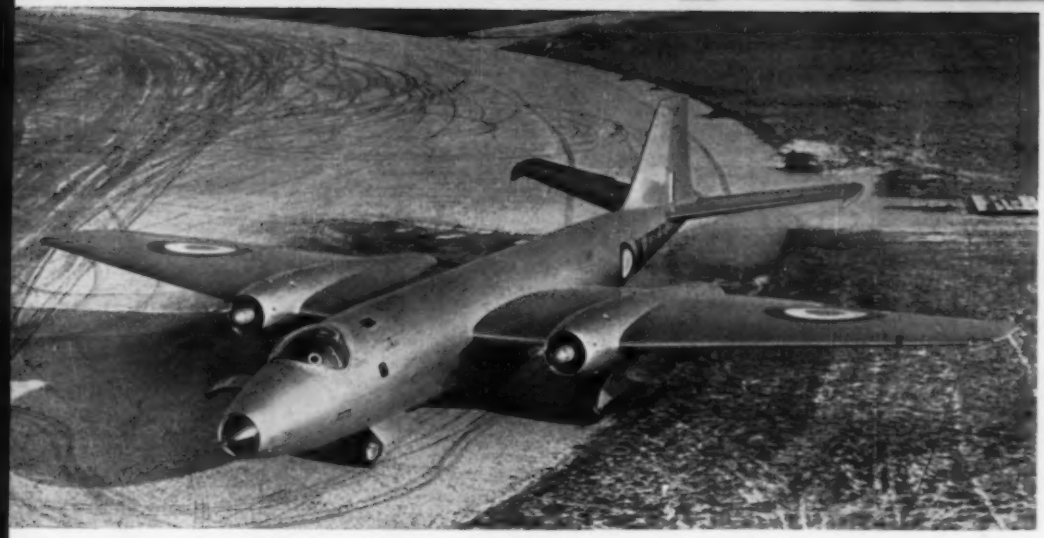
Most of the air freight now taken across the North Atlantic goes as "makeweight" in the cargo compartments of passenger aircraft; this makes possible a reasonably low rate structure. All-freight services with DC-4s—until recently the only cargo aircraft available—are at present being operated by PanAm and T.W.A., with a total of three round trips weekly. K.L.M. are at present leading the field, operating two return flights weekly with two brand-new DC-6As. Both PanAm and Sabena will introduce DC-6A transatlantic freight services later this year.

The total annual air-freight traffic between Europe and America is in the region of 10,000 tons, of which PanAm and T.W.A. carry some 40-45 per cent. It has been estimated that a new rate structure based on the abilities of modern all-freight aircraft would immediately attract a further 20,000 tons. We have no spot method of checking the accuracy of this forecast, but if it *is* accurate the implications are enormous.

If Britain is to increase her share of this growing traffic, prompt action must be taken. As in the early post-war days, it may again be necessary to buy American equipment to carry the British flag over the ocean air routes.

If Seaboard's five-year licence is awarded America will have three certificated transatlantic freight carriers to Britain's one. In the circumstances, the Government might consider nominating an additional operator. There are two obvious candidates: B.O.A.C. and Hunting Air Transport (now Hunting-Clan), whose original application for the route contained a realistic proposal to use DC-6As. This suggestion was apparently unacceptable at the time and Hunting's application was rejected.

SECOND INNINGS: At Blackbushe, Miss Sonja Ek, Gothenburg's "Lucia 1953" ("Queen of Light") names (or re-names) Eagle Aviation's Viking "John Benbow," which is used on the company's scheduled London-Aalborg-Gothenburg service. Acquired from B.E.A., the Viking retains its Admiral-class name and the Corporation colour scheme, but now has its 36 seats in the rearward-facing position.



EVEN BETTER: Now in full production at the English Electric Company's Preston works, the Canberra B.6 incorporates all the lessons learned in many thousands of hours of operational flying with the B.2. Numerous detail improvements cannot be discussed, but it is evident that the engines are of the same type as are fitted to the PR.7—i.e. the Avon RA.7.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

A.V-M. R. L. R. Atcherley

TO take over his new post of Head of Air Force Staff, British Joint Services Mission at Washington, in March, A.V-M. R. L. R. Atcherley was due to sail yesterday for America. He will relieve A.V-M.

A.V-M. R. L. R. Atcherley, C.B., C.B.E., A.F.C.

J. D. Breakey, C.B., D.F.C., who has held the position since July 1951.

During his 31½ years of service in the R.A.F. A.V-M. Atcherley has been largely concerned with fighter and ground attack aspects of air operations. His two previous appointments were respectively A.O.C. No. 12 Group, Fighter Command, and C-in-C. Royal Pakistan Air Force. Before going to America he spent a period at the Air Ministry in order to ensure that he was fully briefed on current problems.

North Star Eastwards

LAST week the Canadian Prime Minister, the Rt. Hon. Louis St. Laurent, began a world tour by air in a Canadair Five of No. 412 Squadron, R.C.A.F. He spent two days in London and arrived in Paris last Sunday evening. From there he intends to go on to Bonn (and Canadian military bases in Germany), Rome, the Middle East, Pakistan, India, Ceylon, Java, the Phillipines, South Korea, Japan, Midway, Honolulu, San Francisco, and expects to return to Ottawa in mid-March. The captain of the aircraft—which is the specially appointed Canadair in which the Queen flew during her Canadian tour—is W/C. H. A. Morrison, D.S.O., D.F.C. Last November this crew made a preliminary 31,000-mile, round-the-world flight in 23 days. Mr. St. Laurent's journey is described as a "voyage of goodwill and exploration."

Engineering Appointments

TWO appointments to the Air Ministry have been announced. A.Cdre. G. B. Beardsworth, C.B., at present S.T.S.O., F.E.A.F., is to become Director of Air Engineering, and A. Cdre. D. W. R. Ryley, C.B.E., at present S.T.S.O., Coastal Command, is to become Director of Armament Engineering. Both appointments take effect this month.

A. Cdre. Beardsworth, who has held his present post since April, 1951, was previously S.T.S.O., Fighter Command, for two years. During the war he served at R.A.F., Gosport, H.Q., Technical Training Command, and at No. 32 O.T.U. in Canada. At the end of the war he was Command Engineer Officer, R.A.F. Mediterranean and Middle East Command.

A. Cdre. Ryley, an armament specialist, was from 1949 until early 1952 the first commandant of the R.A.F. Technical College, Henlow. He was commissioned from Cranwell in 1925. From 1941 till 1943 he was Director of Small Arms and Ammunition with the U.K. Mission in the U.S.A. and Canada. He then served on the Ordnance Board at Woolwich and later commanded the Experimental Establishment at Pendine.

H.M.S. "Eagle" Mobile

BAD weather temporarily interfered with the embarkation programme of F.A.A. squadrons in H.M.S. *Eagle*, 36,800 tons, as she steamed down Channel to take part in the Home Fleet spring cruise. Although the Skyraiders and Avengers from R.N.A.S. Culdrose landed on, bad weather both at sea and on land prevented the embarkation of No. 806 Sea Hawk Squadron until February 1st. H.M.S. *Eagle*'s Air Group includes No. 806 Squadron, two squadrons of Attackers, one squadron of Avenger A.S.4s, one squadron of Hornet night fighters, two flights of Skyraiders and a number of S-51 helicopters for rescue and communications duties.

It was during these operations that Pilot Eben Leavitt, U.S.N., serving under an exchange posting with No. 73 Service Trials Unit, made the 7,000th deck landing on *Eagle* in an Avenger. After being presented with a suitably inscribed cake, he took off for R.N.A.S., Ford. It will be remembered that Lt.-Cdr. D. G. Parker, D.S.O., D.S.C., A.F.C., R.N., was similarly honoured when he made the 5,000th angled-deck landing during trials on U.S.S. *Antietam* in the Channel last summer.

Lt.-Cdr. Parker at present commands No. 898 Squadron, which is working up on Sea Hawks in Pembrokeshire. No. 804 is similarly engaged in Scotland. After the cruise No. 806 Squadron will spend a short period ashore in the U.K. before embarking in H.M.S. *Centaur*, the new Hermes-class carrier which is nearing completion at Portsmouth. No. 803 Squadron (Attackers) is also due for re-deployment after the cruise. It will become the first naval jet fighter squadron based abroad when it moves to Malta in the summer.

Flying his flag in H.M.S. *Eagle* is the Flag Officer Heavy Squadron, Rear-Admiral W. T. Couchman, C.V.O., D.S.O., O.B.E., who led the F.A.A. fly-past in the Coronation Naval Review at Spithead last year. *Eagle* sailed for Gibraltar on February 8th and will return to England in the summer for a refit. She may then be fitted with the new angled deck.

(*An "Eagle" landing-on picture appears overleaf*)

R.A.F. Rugby Captain

AFTER having played rugby for the R.A.F. since the 1947-48 season, F/L. R. V. Stirling is not only captain of the R.A.F. XV but also skippered the Combined Services team, the Midland Counties team and the England XV against the All Blacks.

F/L. Stirling, who is 34, joined the Service as a Halton apprentice in 1935. On

F/L. R. V. Stirling.

passing out he was posted to the Indian North-West Frontier, with No. 27 Squadron—which then had Westland Wapitis—as a corporal in the armament section.

SERVICE AVIATION...

GOING ABOARD: A Hawker Sea Hawk of No. 806 Squadron R.N. about to touch down on the flight deck of H.M.S. "Eagle." Details of the aircraft complement of "Eagle" appear on the previous page.

Later he became a flight sergeant instructor at Karachi.

Commissioned in February 1944, he became Senior Armaments Instructor of the O.T.U. at Wymeswold, and later went to Coastal Command. Volunteering for further service abroad, he was posted to No. 301 M.U. at Karachi in August 1945 and remained there for 2½ years.

Returning to England, he was for a time station armament officer at Cranwell; later, after completing a senior specialist course, he was appointed to his present armament engineering post at the Air Ministry.

Canberra Polar Flights

THE latest 12-month course at the R.A.F. Flying College, Manby, Lincs, will end traditionally with a series of long-distance flights to many parts of the world. Altogether, five different parties composed of members of the staff and students will set out from the College during the first half of February. One of these will fly the Canberra *Aries IV* which already holds the London-Cape Town and Cape Town-London records. Piloted by W/C. C. S. G. Stanbury, D.S.O., D.F.C., and navigated by F/L.s H. T. Williams and R. L. Atkinson, *Aries IV* will cross the Atlantic to Ottawa *via* the Azores and make a series of flights in the North Magnetic Pole region. The present high-altitude navigational techniques for high-speed aircraft will be tested. The aircraft will cover 14,000 miles and return to Manby on March 2nd.

Two Hastings will cross the Atlantic *via* the Azores and Bermuda. One of them piloted by W/C. W. J. Burnett, D.S.O., D.F.C., will take two teams to Ottawa to tour Canada and Alaska. The other, captained by W/C. A. H. Humphrey, O.B.E., D.F.C., A.F.C., will fly to Washington, carrying a group whose members are to visit the United States.

The last group, in which are one R.C.A.F. and two U.S.A.F. officers, will visit NATO countries, including Norway, Denmark, Germany, Italy, Greece and Turkey. They will fly in a Valetta piloted by S/L. A. C. Blythe, D.S.O.

The teams visiting Canada and Alaska will be led by G/C. J. C. Miller, D.S.O., and G/C. R. E. Burns, D.F.C. With the Alaskan party will be W/C. G. G. Petty, D.S.O., D.F.C., a pupil at the College who, last December, established the London-Cape Town record in *Aries IV*. In command of the United States team will be G/C. F. S. Stapleton, D.S.O., D.F.C., chief instructor at Manby. W/C. Humphrey, the senior instructor, flew *Aries IV* to gain the Cape Town-London record. In charge of the NATO detachment will be W/C. J. D. D. Collier.

R.A.F. Appointments

AMONG recent appointments announced by the Air Ministry are the following: G/C. N. C. Walker to Church Lawford and W/C. F. N. Brinsden to Macmerry, to command. For technical staff duties W/C. H. J. Irens has gone to H.Q., M.E.A.F., W/C. C. J. Giles, O.B.E., to H.Q. Flying Training Command and W/C. J. C. Pope to Shawbury, Salop.

To serve on administrative staffs W/C. J. B. Conolby and W/C. F. G. Metcalf have been posted to H.Q., M.E.A.F., and W/C. P. G. D. Taylor to H.Q. Flying Training Command.

W/C. L. D. Mavor, A.F.C., is now in the Department of the Air Member for Personnel, W/C. J. Wood, D.F.M., has gone to No. 2 Air Navigation School as an instructor and W/C. S. V. Vaizey to H.Q. 2nd T.A.F. air staff. W/C. R. Allison is now in the Ministry of Supply and W/C. A. P. Dottridge has gone to AAFSE for staff duties.

VULCAN VISITOR: Air Marshal Sir George Mills, C-in-C. Bomber Command, recently visited Avros to see and discuss the Vulcan. Left to right: A. Cdre. G. A. Walker (Cmdt., R.A.F. Flying College, Manby), A. V-M. A. McKee (Senior Air Staff Officer, Bomber Command), Air Marshal Sir George Mills and Sir Roy Dobson (managing director, A. V. Roe and Co., Ltd.).

Sir Robert Foster

THE *London Gazette* of February 2nd announced the retirement of Air Chief Marshal Sir Robert M. Foster, at his own request, in order to facilitate the promotion of younger officers. He is 55. Sir Robert's post as C-in-C. 2nd T.A.F. has been taken over by Air Marshal Sir Harry Broadhurst.

A.O.C. Cyprus

AFTER having been Secretary-General, AAFCE, for the past twelve months, A. Cdre C. D. C. Boyce, C.B., C.B.E., has taken up his new appointment as A.O.C. Air H.Q. Cyprus. Before going to AAFCE, A. Cdre. Boyce took the 1952 course at the Imperial Defence College.

Northern Ireland Wings Parade

THE first course to pass out from No. 2 F.T.S. since its re-formation at R.A.F. Cluntoe, Northern Ireland, in February 1953, were due to receive their "wings" from Brig. J. A. Sinton, V.C., O.B.E., Her Majesty's High Sheriff for County Tyrone. The parade was arranged for February 10th.

No. 2 F.T.S. was first formed at Duxford in 1920. It operated at Digby and Brize Norton before the war and was re-formed at Church Lawford in 1947; it moved to Cluntoe last year.

Reunions

THE eighth reunion dinner of R.A.F. and W.R.A.F. of No. 3 Glider Training School is to be held on March 6th at the "Griffin," Villiers Street, Strand, London, W.C.2. Particulars from Joan Sherman, 10 Bramford Court, High Street, Southgate, London, N.14. Phone: Royal 4114.

No. 194 Squadron reunion dinner will be held on March 27th at the Criterion Restaurant, London. Particulars from D. O. Williams, 63 Burnt Ash Hill, Lee, London, S.E.12 (Lee 2552).

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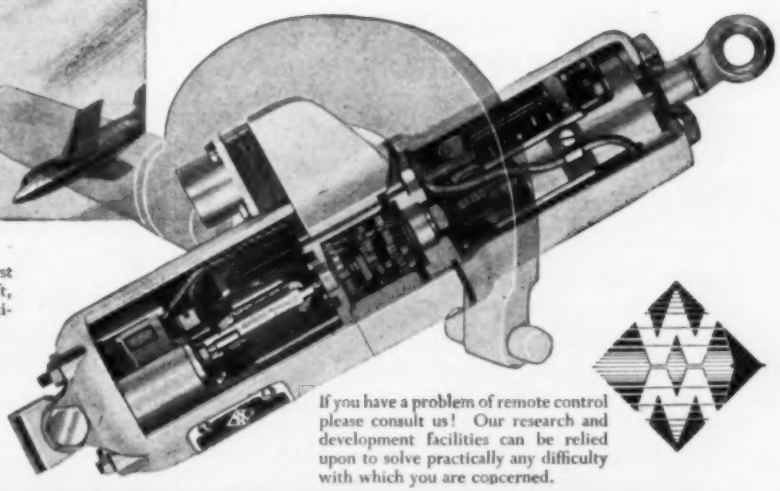

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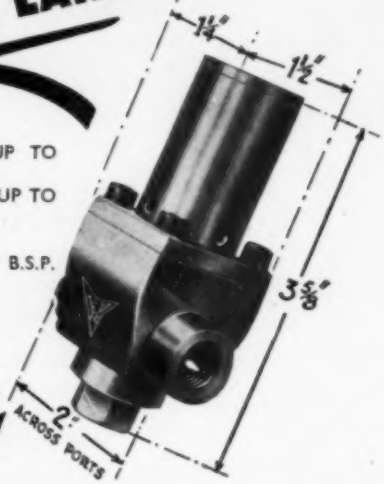

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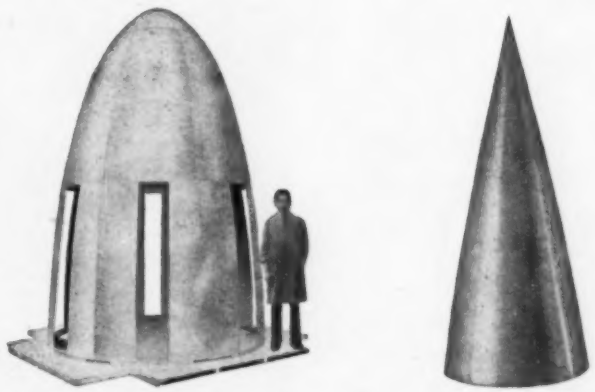

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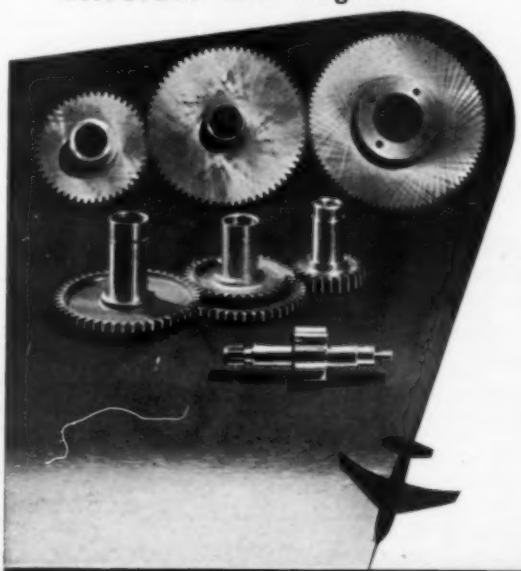

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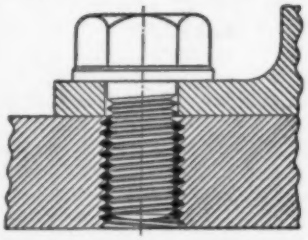

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM British European Airways Corporation of Keyline House, Ruislip, Middlesex:—

Application No. 266 to re-route via a traffic stop at Oslo instead of at Copenhagen as at present their normal scheduled service between London and Stockholm on the route set out as Route 26 in Schedule "A," Part II, of the terms of reference issued to the Air Transport Advisory Council by the Minister of Civil Aviation on July 30th, 1952.

Application No. 267 for a normal scheduled service with Viscount, Viking, D.H. Ambassador and/or Dakota aircraft for the carriage of passengers, supplementary freight and mail between London Airport or Northolt and Bergen, at a frequency of from three to seven services weekly increasing according to demand initially during the season from May to September inclusive and possibly later throughout the year, for a seven-year period commencing May 1st, 1955.

THESE applications will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9, Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [1631

TUITION

THE COLLEGE OF AERONAUTICS

THE Board of Entry of the College invites applications from suitable candidates for the two-year course which begins in October, 1954, and ends in June, 1956.

CANDIDATES should be of graduate standard, although the possession of a degree is not essential; a good Higher National Certificate is an acceptable standard.

THE College, a post graduate institution, is devoted to the study of aeronautical science and engineering. The curriculum covers the five main subjects of aerodynamics, aircraft design, aircraft electrical engineering, aircraft propulsion and aircraft economics and production. Instruction in the first year is designed to provide students with a broad background of knowledge in all these subjects, with opportunity for limited specialization in two or three of them. In the second year students specialize more particularly, usually in one subject.

EXPERIMENTS in the air are an important part of the work, both in the first year when all students take part in them and in the second year when they are linked to the specialist work of the departments.

STUDENTS who satisfactorily complete the course will receive the Diploma of the College.

FURTHER particulars and details of the procedure for application may be obtained from the Warden, The College of Aeronautics, Cranfield, Bletchley, Bucks. [1622

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with airframe experience.

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for work on installation of aircraft auxiliary apparatus.

A.4. Senior Draughtsmen
for modification design work.

A.5. Senior Draughtsmen
Jig and tool.

A.6. Intermediate and Junior Draughtsmen
For work on mechanical and electrical design. O.N.C. standard.

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Jig and tool.

Write in detail or send a postcard for Application Form, quoting reference number of post sought, to:—

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The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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LECTURER in experimental electricity (electronics) required to cover fundamental electronic circuits, including pulse circuits and their application to the measurement of non-electrical quantities. He will also assist in the development of the specialized electronic instruments required by all departments of the College in their research work. Honours degree in physics or electrical engineering required, with experience in at least one of the following fields: Airborne radio and radar systems; servo mechanisms; electronic techniques in measurement and control. Salary within range £600-£1,000 p.a. with superannuation under F.S.S.U. and family allowance.—Applications, giving full particulars and containing the names and addresses of not more than three referees, to the Recorder, The College of Aeronautics, Cranfield, Bletchley, Bucks. Further particulars available. [1606

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VACANCY for junior technical engineer, electronics section.
QUALIFICATIONS: Preferably honours degree, specializing in electronics science; should have had reasonable practical experience in application to engineering problems and be able to devise and adapt equipment for specialised instrumentation purposes to high-speed mechanical problems associated with aero-engine application.
APPLICATIONS, giving details of age, experience and qualifications, should be addressed to: THE Personnel Manager, Bristol Aeroplane Co., Ltd., Engine Division, Filton House, Bristol. [1620

TECHNICAL representative required for a large aero engine company in the west of England.
ESSENTIAL qualifications are experience in compressor and turbine blades and allied precision manufacture.
APPLICANTS must be of good presence and have production experience in a supervisory capacity.
APPLICATIONS, which will be treated in the strictest confidence, should give details of previous experience and positions held, together with salary required, and should be addressed to the Personnel Manager, Box INC.3402, A.K. Advg., 212a, Shaftesbury Ave., London, W.C.2. [1626

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CHIEF engineer for light aircraft. "A," "B" and "C" Licences preferred, but "B" not essential.—Midland Aero Club, Elmdon Airport, Birmingham. [1602

WANTED, qualified Dakota captain, 1st officers. —Full details to Starways, Limited, Liverpool Airport, Liverpool 19. [1596

REQUIRED immediately, ex-R.A.F. technical officer with practical aircraft factory planning experience for contract in Belgium with aircraft manufacturing company starting new project.
APPLICATIONS in writing, stating age, qualifications and experience, including copy references. Appointment according to qualifications and experience. Other vacancies for planning clerks, etc.
APPLY to S.A.B.C.A., Aircraft Production Department, 1470, Chausee de Haacht, Haren-Bruxelles, Belgium. [1624

MODERN and expanding aircraft design and drawing office, engaged on the design, modification, conversion and repair of modern aircraft, seeks the following additional staff:—
1 Stressman/designer.
1 Senior draughtsman.
1 Interior fittings and decorations designer for designing furniture, etc., for V.I.P. aircraft. Experience in similar capacity preferable but not essential.
IN all cases assistance is given with housing problems where this is necessary.
APPLICATIONS with full details to: Personnel Manager, Marshalls' Flying School, Ltd., Airport Works, Cambridge. [1628

DESIGN draughtsman with experience of high-grade mechanical design work required to act as checker in gas turbine dept. of East Midlands firm. Gas turbines in full production. Pensionable.—Box 3319. [1629

SENIOR or intermediate stressman urgently required. —Apply, in writing, stating age and experience, to the Chief Designer, The Heston Aircraft Co., Ltd., Heston Airport, Hounslow, Middlesex. [1594

A VACANCY exists for a senior man in the electrical design section of Saunders-Roe, Ltd. Applicants for this post should have good aircraft drawing office experience and qualifications up to A.M.I.E.E. standard.
PENSION and assurance schemes are in operation and practical assistance will be given with housing.
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FERRANTI, Ltd., Edinburgh, have a vacancy for a senior stress engineer for airframe stress work, resulting from fitting experimental equipment in aircraft. Applicants should possess a degree or equivalent, and must have experience in stress office work.
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SENIOR and intermediate design draughtsmen with good experience of aircraft or light structural or mechanical engineering, required for aircraft and armament project work.—Apply, by letter, to Portsmouth Aviation, Ltd., The Airport, Portsmouth. [0612

SENIOR draughtsmen required for wide variety of design problems on aircraft and guided missiles, pleasant office conditions, etc.—Apply to Chief Designer, The Heston Aircraft Co., Ltd., Heston Airport, Hounslow, Middlesex. Tel.: Hayes 3844. [1632

TECHNICAL representative required for a large aero-engine company in the West of England. Essential qualifications are a good all-round experience in general engineering with special emphasis on sheet metal fabrication and compressor and turbine blades.
APPLICANTS must be of good presence and have production experience in a supervisory capacity. Applications, which will be treated in the strictest confidence, should give details of previous experience and positions held, together with salary required, and should be addressed to the Personnel Manager, Box 1N C.3390, A.K. Advg., 212a Shaftesbury Avenue, London, W.C.2. [1618

DESIGNER/DRAUGHTSMAN required immediately to develop mechanical and electrical instrument equipment. London 15 minutes, station 3 minutes from factory. Frequent bus services.—Write, qualifications and experience to Bryans Aeroquipment, 15 Willow Lane, Mitcham Junction. [0609

SENIOR design draughtsman for aeronautical engineering on high-speed turbines, servo-mechanisms, gyros, etc. Minimum qualifications: Higher National Certificate and at least five years design experience with responsibility. Commencing salary £750 per annum.—Write in confidence to Box 3280. [1614

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H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0420

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TEST laboratory assistants (male) required by Percival Aircraft, Ltd., Luton Airport, Beds. National Certificate standard and previous experience on design of test laboratory equipment desirable. Good welfare facilities including staff pension scheme.—Applications, stating qualifications, experience, age and salary required to Personnel Manager. [0596

DESIGN draughtsman required to work on conversion and repair of aircraft. Must be capable to work on own initiative. Some knowledge of stress analysis an advantage. Salary commensurate with experience and ability.—Please apply to the Personnel Office, Field Aircraft Services, Ltd., Nottingham Aerodrome, Tollerton, Notts. [1556

OPPORTUNITIES exist for first-class senior and intermediate airframe stressmen in the development of new projects. Permanent posts at good salaries for suitable applicants.—Applications, in writing, should state age, experience and salary expected, and be addressed to the Chief Designer, Auster Aircraft, Ltd., Rearsby Aerodrome, Leicester. [1604

CIVIL SERVICE COMMISSION. (1) Naval cadetships (special entry); (2) First appointments in the Royal Marines; (3) Entry to the Royal Military Academy, Sandhurst; (4) Royal Air Force cadetships. Examinations begin on May 25th, 1954. Centres for written examination include one in Germany (British Zone). Age on July 1st, 1954 for (1) and (2) above: 17 years 2 months to 18¼; (3) 17½ to 18¼, and (4) 17 to 19.

FOR further particulars and application forms write (preferably by postcard), to Secretary, Civil Service Commission, Burlington Gardens, London, W.1, quoting No. 1002/54. Completed application forms to be returned by March 11th, 1954. [1612

OPPORTUNITIES exist for first-class senior and intermediate aircraft design draughtsmen to play a prominent part in the design of completely new projects. Permanent posts at good salaries for suitable applicants.—Applications, in writing, should state age, experience and salary expected, and be addressed to the Chief Designer, Auster Aircraft, Ltd., Rearsby Aerodrome, Leicester. [1603

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd., Luton Airport, Beds. Applications are invited from senior and junior draughtsmen and stressmen for work on this interesting programme. Good welfare facilities, including staff pension scheme.—Write, giving details of experience and salary required, to Personnel Manager. [0595

ARMSTRONG SIDDELEY MOTORS, Coventry, have vacancies for a number of designers and senior and junior draughtsmen. Although gas turbine experience is most advantageous it is not necessarily essential as training will be given in this specialized work to suitably qualified draughtsmen.—Apply in detail to Reference F.103, Personnel Manager, Armstrong Siddeley Motors, Coventry. [0200

DESIGNERS, stressmen, weight estimators and aerodynamicists required to work in new design office at Farnborough, Hants. Only first-class men should apply.—Applications, which will be treated as confidential, should state experience, qualifications and salary required, and be addressed to the Chief Designer, Auster Aircraft, Ltd., Rearsby Aerodrome, Leicester. [1560

HANDLEY PAGE (Reading) Ltd., The Aerodrome, Woodley, Reading, have vacancies in their Design Office for senior and intermediate stressmen and for senior, intermediate and junior weightsmen. They are required for work on an interesting new project with good opportunities for advancement.—Please send full particulars of experience, etc., to the Personnel Officer. [0253

PHYSICIST, age 30-35, required to organize and control test house and laboratory of a prominent packaging company in Kent. Duties will include assessment of packaging problems, advising customers on packaging aspects of the design of their products and formulation of guiding principles for use in company routine. Applicants should have a good honours degree followed by wide practical experience of physical testing; a knowledge of tropical proofing problems an advantage. The post offers considerable prospects for the man with the necessary tact and ability to take responsibility.—Please reply, with full details of experience, etc., to Box 3237. [1611

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Vacancies exist in our Design Organisation for writers capable of extracting data from Engineers' drawings and expressing it in clear and concise English. A methodical approach and a thorough knowledge of Electrical and/or Hydraulic mechanisms are the minimum qualifications for this interesting and progressive post.

Write in detail, quoting position sought, to:—

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Applications giving details of experience and qualifications should be addressed to the Personnel Manager, The Bristol Aeroplane Co. Ltd., Aircraft Division, Filton House, Bristol.

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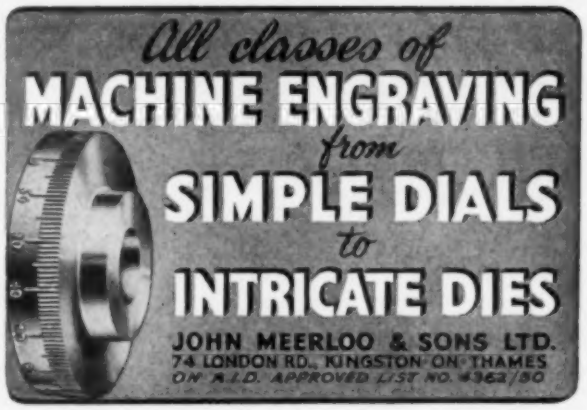

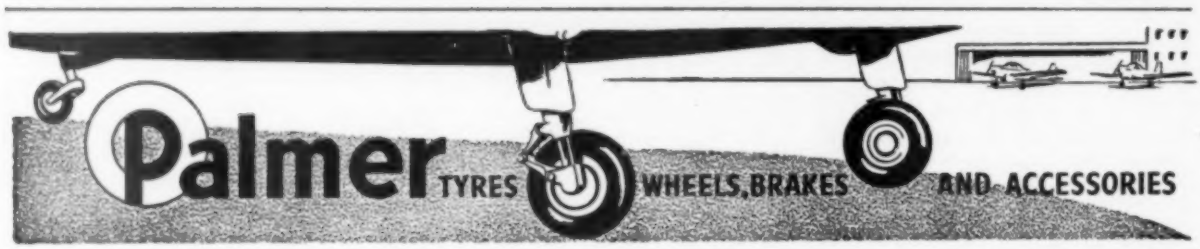

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